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DEPRECIATION OF ELECTRIC RAILWAYS.

In a recent case that involved the valuation of a large electric-railway system before the Railroad Commission of Wisconsin, an engineer who appeared as a witness for the railway company gave the following for the life and annual percentage of depreciation of electric railways.

For the purpose of classification the electric plant and equipment were divided into ten items, and a life in years and a corresponding rate of depreciation was assigned to each.

On land no depreciation was assigned. Buildings were divided into two classes, namely, those containing the power plant and all others. For the power plant buildings the assigned life was twenty-five years and the annual depreciation was taken at four per cent of their reproductive cost. All other buildings connected with the railway had their life taken at fifty years, with annual depreciation at two per cent on their cost of reproduction.

For the entire power plant equipment, including both the steam and the electric generating plant, the composite life was fixed at twelve-and-one-half years, with the corresponding rate of eight per cent on their new cost at this time as the measure of its annual depreciation.

The track and track structures, the electric distributing system, the cars and their equipments, the tools and machinery necessary to operate the plant, and the office furniture were also assigned lives of twelve-and-one-half years, with the eight per cent rate of depreciation annually on their reproductive cost.

Paving was given a life of ten years, with ten per cent annual depreciation, and so also were the horses, wagons and miscellaneous articles used in the business, but no sum was provided for the depreciation of the paving.

For the entire plant, exclusive of the land, including all the equipment and articles named above, the conclusion of the witness was that the annual depreciation amounted to 7.67 per cent on the reproductive cost.

The percentages given above were intended by the witness to cover all sorts of depreciation, including obsolescence and inadequacy, as well as physical wear and decay, but he expressed some doubt as to whether these figures would ultimately prove large enough for all of these elements.

It is to be noted that the so-called sinking-fund method of computing depreciation is not involved in the figures given above, but that the percentage of annual depreciation is found for each class of items by the division of its years of life into

100 per cent, just as the amount in dollars of annual depreciation is found by the division of the years of life into the cost of reproduction.

In other words, the figure of 7.67 per cent for the composite depreciation of the plant means that in thirteen years the sum necessary to offset depreciation must equal the present reproductive cost.

On this basis, it appeared that 24.23 per cent of the annual gross earnings of the electric railway property were necessary to make good its loss through depreciation. Without attempting to pass on the above figures, they are offered as an interesting opinion on an important subject.

THE TRANSFER OF HEAT.

One of the classical papers read at the recent meeting of the American Railway Master Mechanics' Association at Atlantic City, N. J., was entitled "Heat Transfer," by Professor Charles E. Lucke, of Columbia University. While Professor Lucke's paper was intended mainly to be considered with regard to firing locomotive boilers, his deductions and conclusions apply with equal force to stationary steam boilers, and the hope that he holds out for increased efficiency of heat transfer in locomotive operation would be of equal advantage in steam stations; in fact in its last refinement it is possible that the question of raising the efficiency of heat transfer will concern immediately the large steam stations rather than portable units, for, as President Vaughan pointed out in his opening address, master mechanics must watch the young and powerful rival, the electric locomotive, for it is giving the steam locomotive a close race. In the event of the supremacy of the electric locomotive Professor Lucke's conclusions would have to do essentially with the stationary steam station.

The paper under consideration reviewed the great variation in the value of the coefficient of heat transfer, which, strange to say, is found to have a range of from less than 2 to nearly 1,000. There is no way of applying heat easily to a working fluid except by internal combustion, and in the great mass of real, every-day cases the heat must be applied through plates or tubes or through metal containers. In order to complete a cycle, as a consequence of which heat is transformed into work, there is necessary not only the heat addition period but also a heat abstraction period, for without it the cycle cannot be completed; that is to say, the transformer cannot be returned to its original condition. What seems to be a transfer law of great importance is often stated in connection with such cases as these, as follows: The heat which will pass from a region of high temperature to a region of low temperature is directly proportional to the difference between those temperatures, to the amount of surface through which it may pass, and to the time available. This seems almost axiomatic, and so the coefficient of heat transfer would appear to be a proper measure of the phenomenon, and we find that the British thermal unit per square foot per hour per degree difference of temperature is a basis coefficient in each published work on the subject. As was stated above, this coefficient varies from 1.8 in refrigerating rooms with still air when either ammonia or brine is in the pipes, up to 1,000 in some forms of feed-water heaters and condensers. It is found that the value of the coefficient is increased by vigorous circulation of either the gas or fluid involved, and in fact there are many ulterior conditions which have a decided effect upon the value of this coefficient.

In order to test out the factors affecting the value of the coefficient of heat transfer a number of experiments were conducted at Columbia University with the idea in mind of probably establishing a law of relation between the coefficient and the velocity of the liquid or gas involved. Professor Lucke's conclusions are: (1) That laws of heat transfer applying to the whole subject do not exist; (2) that there is a possibility of enormous improvement in the transfer rate of apparatus involving gases. To his mind there is the possibility of raising the heat transfer coefficient of a steam boiler from its low value of 3 or thereabouts to at least 100. Should such a series of tests be successful, and there is every promise that they may easily be, boilers with perhaps 100 times the present capacity might be developed with the same heating surface.

CANDLEPOWER OF BOSTON STREET LAMPS.

Prior to the date when the recent contract was signed for street lighting in Boston a number of tests of the proposed lamps were made with portable photometers along the streets, and it is now possible to present some of the results.

Boston streets have been lighted for a number of years with direct-current enclosed arc lamps operated with about 6.6 amperes and 500 watts each, and during the past year the Edison Company has supplied about 3,200 of these lamps.

Though these direct-current enclosed arcs have given Boston the reputation of being one of the best-lighted cities in the country, it was felt that an even better lamp was desirable under the new contract, especially as the gas company proposed to show what could be done with high-pressure gas lamps. It was accordingly arranged to displace much the greater number of the enclosed arcs with 6.6-ampere, 500-watt magnetite arc lamps, and to locate several 6.6-ampere, 500-watt flaming-arc lamps at important points, notably in Copley Square. Some of the magnetite arc lamps were given a trial on Commonwealth Avenue, and in an adjoining block a number of the Graetzin inverted double-mantle gas lamps were located by the gas company. Many details concerning the above lamps were noted in editorials of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 15 and 22 last.

Tests on the flaming-arc lamps, the magnetite arcs, the enclosed arcs, and on the Graetzin inverted gas lamps were made on several nights with a portable photometer so as to obtain the candlepowers of these several lamps under the conditions of actual service. In the case of each electric lamp the photometer was placed so as to avoid interference with the light by the side rods of the carbon holder, and to measure the candlepower at an angle of twenty-five degrees below the horizontal.

On the evening of April 27 and May 3, 1909, the candlepowers of each of the three flaming-arc lamps at Copley Square were found to give an average of 2,515 and 2,966 candlepower, respectively.

Four of the old 500-watt, direct-current, enclosed arc lamps in certain locations near Copley Square were tested on April 27 and found to give 260, 419, 601 and 712 candlepower, respectively, the average for the four being thus 495 candlepower. On the lamp of the last-named type at the corner of Clarendon and Newbury streets a test with the arc on the side of the carbons away from the photometer gave 200 candlepower; a test with the arc on the side of the carbons nearest to the photometer gave 880 candlepower, and midway between these two positions the candlepower was 371, so that the average of the three tests was 484 candlepower. These three tests on the same lamp show how uncertain the results obtained by an observation in only one direction may be as to the candlepower of an arc.

On April 29, 1909, ten magnetite arc lamps on Commonwealth Avenue, of the 6.6-ampere, 500-watt type, were tested, and the candlepowers of these ten lamps varied from 906 for the lowest to 1,400 for the highest, with an average for the ten of 1,150 candlepower. From these figures it appears that the candlepower of the magnetite lamps is more than double that of the direct-current enclosed arcs of the same wattage that are to be displaced at the angle of twenty-five degrees below the horizontal.

Eight of the Graetzin double-mantle inverted gas lamps on Commonwealth Avenue were tested on the evening of the third of May, and the candlepowers were found to vary from 88.8 at the lowest to 142.6 at the highest, the average for the eight being 112.2 candlepower. These gas lamps were operated at the ordinary pressure in the mains on Commonwealth Avenue and were supposed to be adjusted for a consumption of seven cubic feet per hour each, but as it is not understood that each lamp was provided with a pressure regulator, and as the pressure in the gas mains at Boston is known to be subject to large variations, the actual consumption at each gas lamp is somewhat uncertain. If the consumption was seven cubic feet per hour at each lamp, the average candlepower of 112 amounts to sixteen candles per cubic foot per hour.

A single-mantle inverted Graetzin burner that appeared to be of similar type to the double-mantle burners on Commonwealth Avenue was tried on a test meter and found to consume 3.2 cubic feet of gas per hour at a pressure of nineteen-tenths inches of water, corresponding to 6.4 cubic feet for a double burner of this pressure, but in some of the gas mains at Boston the pressure runs up to about twice the figure just stated, and this increase of pressure of course increases the consumption of an unregulated burner.

While the Graetzin burners have entirely failed in their competition with electric arcs for street lighting in Boston, they and other incandescent gas lamps are still being considered in competition with tungsten lamps for many miles of the city's streets.

YELLOW PINE FOR POLES.

In line with the notable work which the Forest Survey of the United States Government has been performing in recent years concerning the conservation of the timber supplies and experimentation looking to increasing the life of the materials already in use, is the work which has been under way for some time in processing yellow pine. The western red cedar is largely used on the Pacific Coast for poles, but in certain interior parts of California the wood is expensive, owing to the high cost of rail shipments from the mountains added to the cost of water transportation from the Puget Sound region to San Francisco. In the San Joaquin Valley the native yellow pine obtained from the surrounding mountains has been used to a limited extent for poles. This tree has a number of qualities which make it desirable pole timber, but it is not durable and decays at the butt in a few years when set without being given a preservative treatment.

An experimental plant operated near Fresno, Cal., by the Forest Survey has recently completed a series of tests, treating about 600 poles. It was found that the western yellow pine ranks among the woods which are most easily impregnated with preservatives, and that when thoroughly seasoned a penetration of from two to three inches was obtained by immersing the butts of the poles in a tank of hot creosote for a period of one hour, followed by five minutes' immersion in cold creosote. The government experts are of the opinion that since the treatments can be conducted with comparatively simple and inexpensive apparatus it seems certain that the pine pole with creosoted butt will replace the cedar pole in many localities when its advantages are more commonly recognized.

CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

In another part of this issue will be found a preliminary report of the first two days' proceedings of the annual convention of the American Institute of Electrical Engineers which at this writing is being held at Frontenac, N. Y. The arrangement of the programme this year has been quite effective in grouping topics of similar character. The early reports of the convention's progress indicate that its programme is being carried out with a fairly good division of time among the very numerous papers so that none of the topics is likely to be crowded at the close of the convention for lack of time. Where such a large number of papers is presented before a body for consideration in three-and-one-half days, it must follow that but comparatively little time can be devoted to any one topic, and therefore it is imperative that each paper be considered in as thorough and yet condensed a manner as possible. The topics that are being discussed show clearly the problems with which electrical engineers are at the present time chiefly contending. Among these more important problems may be mentioned the variable-speed induction motor, rolling-mill motors, testing of transformer steel and long-distance transmission lines. Each of these topics has been treated with more than one paper.

CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

(*Special Dispatch to the* ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.)

Frontenac, N. Y., June 30.—Attended by every desirable element in the form of summer splendor, perfect weather, most delightful surroundings and comfortable appointments, the twenty-sixth annual convention of the American Institute of Electrical Engineers was opened here auspiciously on Monday morning, June 28, at the Hotel Frontenac, in the midst of the famous Thousand Islands.

About 250 members and guests were registered when the first session was called at 10 a. m. by President Louis A. Ferguson. The first number on the programme was the reading of the president's address. Mr. Ferguson took for his subject "The Centralization of Power Supply." He pointed out the marked tendency today toward the consolidation of large interests. The economy secured through combination results in material benefits to the whole people. As an outcome of the centralization of power development, investors are now looking with great favor upon electrical securities. The naturally monopolistic character of public utilities is being recognized and legal ways are being made for monopoly privileges under proper regulation. The opportunities for engineers were never greater than now for conferring upon the people the benefits and advantages of electricity obtained through centralization.

President-Elect Lewis B. Stillwell was then introduced. On assuming the chair he made a brief address. In perfect accord with the schedule for the morning session, the following papers were then read: "The Convection of Heat from Small Copper Wires," by A. E. Kennelly, C. A. Wright, and J. S. Van Bylevelt; "An Alternator for 100,000 Cycles," by E. F. W. Alexanderson; "A Method of Testing Transformer Core Losses Giving Sine-Wave Results on Commercial Circuits," by L. W. Chubb; and "Testing of Transformer Steel," by M. G. Lloyd and J. V. S. Fisher. Spirited discussions followed the reading of these papers.

The Monday afternoon session was called at 2:30 o'clock. The following papers were read and discussed: "A Sketch of the Theory of the Adjustable-Speed, Single-Phase, Shunt, Induction Motor," by F. Creedy; "The Repulsion Motor with Variable-Speed, Shunt Characteristics," by E. F. W. Alexanderson; "The Reduction in Capacity of Polyphase Motors Due to Unbalancing in Voltage," by S. B. Charters, Jr., and W. A. Hillebrand; "The Current Locus of the Single-Phase Induction Motor," by A. S. Langsdorf; and "Multispeed Induction Motors," by H. G. Reist and H. Maxwell. In the absence of its author, A. Miller Gray, the paper on "The Heating of Induction Motors" was temporarily passed over.

The third session of the convention assembled yesterday (Tuesday) at 10 a. m. At this session there were taken up the papers on "Output and Regulation in Long-Distance Lines" and "Calculation of the High-Tension Line," by Percy H. Thomas; "Even Harmonics in Alternating-Current Circuits," by J. B. Taylor; and "The Resistance and Reactance of Armored Cables," by J. B. Whitehead. Brilliant discussions followed the reading of the two papers by Mr. Thomas. The reading of the paper announced for Mr. Fisher was deferred till the evening session.

At the fourth regular session, that of Tuesday evening, the following papers were read: "Losses, Induced Volts and Amperes in Armor and Lead Cover of Cables," by H. W. Fisher; "Corona Phenomena in Air and Oil and Their Relation to Transformer Design," by W. S. Moody and G. Faccioli; "Surges on Cable Systems with Aluminum-Cell Protection," by E. E. F. Creighton and S. D. Sprong; and "Split-Pole Converters and Storage-Battery Regulation," by J. L. Woodbridge.

At 6 o'clock Tuesday, there was given a dinner by the sections committee, consisting of Paul Spencer, chairman; H. R. King, Paul M. Lincoln, H. H. Norris and D. B. Rushmore, to the officers and delegates from the various sections and branches of the Institute. Following the dinner a number of rousing addresses were delivered and there was a general discussion of the work of the sections and branches in broadening the influence of the Institute. In every way this proved a most enjoyable meeting.

In the way of pure entertainment, the arrangements have been planned excellently. On Monday evening there was a reception at the Hotel Frontenac, followed by a dance and the serving of light refreshments. On Tuesday morning quite a large party of ladies and gentlemen took a boat ride on the New Island Wanderer. On Tuesday afternoon there were played the first round in the handicap golf tournament and also a ladies' putting contest. In the latter the first prize, a solid silver card case, was won by Mrs. Louis A. Ferguson; the second prize, a gold enamel belt buckle, went to Miss Alice A. Reed; three ladies, Mrs. F. A. Donohoe, Mrs. W. I. Schlichter, and Mrs. H. G. Reist, tied for the third prize, a topaz hat pin; when played off this prize was won by Mrs. Donohoe. Each lady entered in this contest received a solid silver lead pencil. Last evening a ladies' bridge-whist tournament was held. In this the first prize, a pearl brooch pin, was won by Mrs. J. M. Wakeman; the second prize, a pair of gold enamel bar pins, was won by Miss Alice A. Reed. In the qualifying round of the men's golf tournament Frank A. Donohoe made the highest gross score, winning thereby a handsome mahogany humidor; E. P. Cox made the best net score and won a solid silver safety-razor set.

A full report, giving all the convention proceedings in detail, will be given in these columns next week. A. A. G.

Chicago's Latest Bomb Outrage.

Late last Sunday night a tremendous explosion in the very heart of Chicago's business district announced to the community that another bomb outrage had been perpetrated.

Fourteen or fifteen persons were injured, one very seriously, and damage to the extent of over $100,000 was done to property. The point of the attack seems to have been the Chicago Telephone Company's Central Exchange in the Chicago Title and Trust Building. The bomb was exploded in the alley back of it. While the chief damage was to the telephone company's cables, cable racks and distributing frames, there was general havoc to the glass windows within a block of the explosion. In the Title and Trust Building over 700 windows were broken. It is the second direct attack on this company's premises. The police, so far, have not succeeded in bringing the guilt directly home in any of the thirty-one cases, and the citizens of Chicago are now very much aroused. It is said on the one hand that the last outrage is the result of labor troubles; on the other hand it is claimed that it is the result of jealousies and bitter war between racing gamblers.

It is significant that some weeks ago, on personal instructions from the Mayor of Chicago, the headquarters of the racing pools were raided by the assistant chief of police, and ten telephones, with a regular private switchboard, confiscated. It is not said that the telephone company

informed on the gambling telephone exchange, nor is it said that the small strike between that company and certain of its electrical workers is particularly bitter. The popular opinion is that the outrages have been the result of a gamblers' war. Up to the time of going to press a reward of $5,500 has been offered for the arrest and conviction of the terrorists. The City of Chicago has voted $3,000 and the Chicago Telephone Company has appropriated $2,500.

The police, as a result of the last explosion, are making strenuous efforts, and one or two important arrests have been made which may or may not furnish a clew to the real ringleaders. Meantime, accident, plate-glass, and, in fact, all insurance companies, are considering the revision of their rates. The extent of the havoc wrought by the last bomb attack has produced a crisis concerning the character of the city's police service. It is considered a very serious condition of affairs on all sides.

Sues Conduit Companies.

Declaring that the city has been defrauded out of $4,348,686 by means of fraudulent accounts and reports, Corporation Counsel Francis K. Pendleton has begun an action in the Supreme Court against the Consolidated Telegraph and Electrical Subway Company and the Empire City Subway Company, of New York city, to compel them to render a detailed accounting, showing the cost of the electrical subway, for which the city paid $12,388,519.

Under the laws of 1884 the city entered into a contract with the companies to construct conduits for the purpose of abolishing overhead wires, and it was especially provided that all electric wires were to run through these subways. By the terms of this contract the subway companies were to be allowed a profit of ten per cent on all moneys expended in the construction work. On the completion of the subways the two companies were to operate them and receive ten per cent of the profits, by way of rentals and other income, the city to receive the balance.

Recently the Consolidated and Empire companies entered a claim against the city for $8,000,000, which they alleged represented their total loss in operating the subways since 1899, when they were completed. This caused the comptroller and corporation counsel to begin an investigation. They found, according to the papers on file, that instead of constructing the subways as provided they had sublet the work to various contractors, and had charged to the city additional percentages of profit which the people had paid.

Fleet to Test Wireless.

Wireless telegraphy will play an important part in the war game of the Atlantic fleet during the summer maneuvers off the New England coast this month.

Admiral Schroeder's flagship Connecticut has been equipped with a set of high-powered wireless telegraph apparatus and the scout cruisers Chester and Birmingham, when they reach the United States from Liberia, also will be equipped with similar instruments. The scout cruisers, which for the first time will participate in the war exercises, will figure in some of the important problems to be worked out by Admiral Schroeder, and the wireless telegraph will come into play in these evolutions.

While the battleship fleet is at sea practicing this summer the experiments will be made with it in long-distance wireless telegraphy. At Brant Rock, Mass., a high-powered station has been erected and at this point Lieutenant-Commander Cleland Davis and Lieutenant George Sweet, experts of the navy in wireless telegraphy, will watch the work between that station and the vessels of the Atlantic fleet carrying the high-powered instruments. Not until the conclusion of these experiments will the Navy Department award the contract for the erection of the station in or near Washington which will be required to send messages 3,000 miles.

Owing to what he considers an exorbitant price, Secretary of the Navy Meyer has cut out the stipulation in the contract requiring an adjunct wireless telephone apparatus which the Department's specifications required should be able to transmit and receive to and from a distance of a hundred miles. The price asked for one of the instruments was $10,000.

Pennsylvania Electric Association.

The annual convention of the Pennsylvania Electric Association will be held at Eagles Mere, Pa., on September 8, 9, and 10. Various committees are working to make this convention successful, enjoyable and profitable, and every indication points to a large attendance. The officers are: President, L. H. Conkling, Scranton; vice-president, E. F. McCabe, Lewistown; secretary and treasurer, E. L. Smith, Towanda. Executive committee, A. R. Granger, Chester; R. S. Orr, Pittsburg; J. H. Perkins, Wilkesbarre; K. P. Fichthorn, Reading.

Metropolitan Plan Soon to Be Announced.

It is reported that the plan of reorganization of the New York city Metropolitan system has been practically agreed upon and that all details will be arranged in the next few weeks, so that the plan can be made public. It is rumored that an assessment of $20 or $25 a share will be levied on the stock, but that bonds or preferred stock will be given therefor. It is also said that the Interborough-Metropolitan Company is prepared to pay any assessment that may be levied to protect its holdings. The plan will be underwritten.

New Laws for Wisconsin Electric Railways.

Three important bills affecting interurban electric-railway service have been passed by the Wisconsin Legislature. The bills are:

1. Providing all electric cars weighing 40,000 pounds or over must be equipped with air brakes. This will affect practically all passenger coaches used in interurban service.

2. Requiring all interurban cars to be heated between October 15 and April 15.

3. Requiring interurban companies to maintain stations in all cities and villages which they reach, whether they be terminal or way stations.

Antarctic Radium.

Advices brought to Victoria, B. C., by the steamship Makura are to the effect that Lieutenant Shackleton's expedition has left Sydney for the purpose of searching for islands believed to exist in the Antarctic. Man has never set foot on Emerald, Nimrod or Doherty islands, which Capt. J. H. Davis, now commander of the Nimrod, is to seek. Professor David, who accompanied the late Shackleton expedition, reports that analysis of the specimens shows the existence of radium in the Antarctic.

Chair of Aviation.

The University of Paris has announced two donations in the interests of aviation.

The first is $100,000 with an annual subvention of $3,000 from Henri Deutsche de la Meurthe for the foundation of a department of technical aeronautics, including studies and researches for the perfection of aerial apparatus of whatever form. The second is $140,000 from Basil Zakaroff, a Greek resident of Paris, for the foundation of a Chair of Aviation.

The Kjellin and Röchling-Rodenhauser Electric Furnaces.

The use of electric furnaces in the iron and steel industry is rapidly increasing. Much study has been made of their application to electric smelting as well as electric refining in the manufacture of the highest grades of iron and steel. Among the electric furnaces that have met with exceptional success in this line are the Kjellin induction furnace and its modified form known as the Röchling-Rodenhauser electric furnace. It will be the aim of this paper to describe the construction and operations of these furnaces and to give some of the results that have been achieved by their use. The data for this description have been obtained chiefly from a paper on this subject read by Dr.

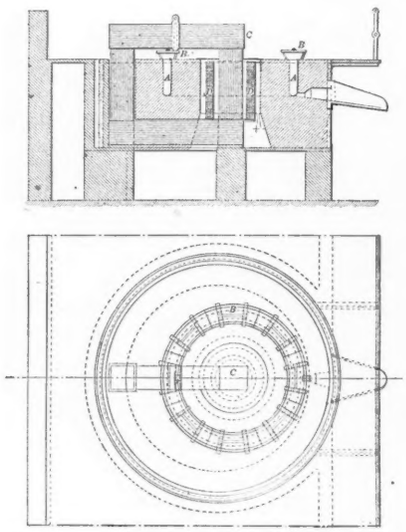


FIG. 1.—SECTIONAL ELEVATION AND PLAN OF KJELLIN INDUCTION FURNACE.

F. A. Kjellin before the recent meeting of the American Electrochemical Society at Niagara Falls, Ont. The illustrations have been loaned by the American Electric Furnace Company.

Dr. Kjellin developed this type of furnace in 1899 and 1900. He had been asked to design an electric furnace for the production of the highest class of tool steel by the general manager of the old iron works at Gysinge, Sweden. On March 18, 1900, the first steel ingot was cast from this furnace. With a consumption of fifty-eight kilowatts from 1,300 to 1,500 pounds of steel ingots were produced each twenty-four hours, the charges being about 220 pounds each. As soon as waterpower was available at Gysinge, about two years later, a larger furnace was built which had an output of about four tons each twenty-four hours with a power consumption of 225 electric horsepower. In this larger furnace the lining was of magnesite instead of silica bricks. This reduced the high percentage of silicon in the steel that had formerly been taken out from the lining and the life of the lining was increased from one week to about twelve weeks.

From a study of the operations of these furnaces a number of German iron-makers became much interested in this matter, and in order to adapt it for their methods the modified form of the Kjellin furnace was devised by them. This later furnace is known as the Röchling-Rodenhauser furnace.

The principle of the Kjellin furnace is shown quite well by the diagrams of Fig. 1. The furnace is practically a transformer in which a bath of molten metal forms the secondary circuit. The transformer core C is built up on laminated sheet iron. About one leg of the core is mounted a primary coil D, which consists of a number of turns of insulated wire or tubing. Surrounding this coil so as to protect it from the heat and also to form a hearth for the furnace is a body of refractory materials. In this, and concentric with the primary coil, is a ring-shaped crucible A, which when filled with molten metal forms the secondary circuit of the transformer. This crucible is provided with covers B and a tap shown in the upper diagram of Fig. 1.

When the primary coil D is energized it induces the secondary current in the molten metal ring. From this fact this type of furnace is called an induction furnace. As in any transformer, the ratio between the primary and the secondary electromotive-forces is fixed by a ratio of the number of primary turns to the number of secondary turns. Since in this case there is but one secondary turn, this ratio is evidently the same as the number of primary turns. Therefore the ratio of the current is also practically the inverse ratio of the potentials; thus in a small furnace of this type a current of 280 amperes at 500 volts supplied to the primary induces a current of 20,000 amperes at seven volts in the molten bath.

In operation the induction furnace is peculiar because it is not possible to fill the crucible with broken pieces of pig iron or scrap and to melt this down. Instead an iron ring is placed in the crucible and melted down to form the bath, or the crucible is filled with molten metal taken from another source. In continuous operation it is the custom to leave a sufficient amount of metal in the crucible to establish a molten bath.

The product from this electric furnace can be controlled in its composition to a nicety. As a result the steel product is of the highest grade. Sample bars have been twisted cold to a much greater degree than has been possible with the best crucible steel. It has been found that molten Thomas-Bessemer steel poured into the Kjellin furnace and left there for some time has improved remarkably in quality. This is explained by the fact that the higher heat of the induction furnace expels the gases dissolved in the steel and also facilitates the removal of the combined oxygen. It has been possible to work this furnace with cold pig iron and pure iron-ore briquettes instead of using pure scrap.

The Kjellin induction furnace has been found to possess a marked advantage in the production of the highest class of steel from pure raw materials and it can compete both technically and economically

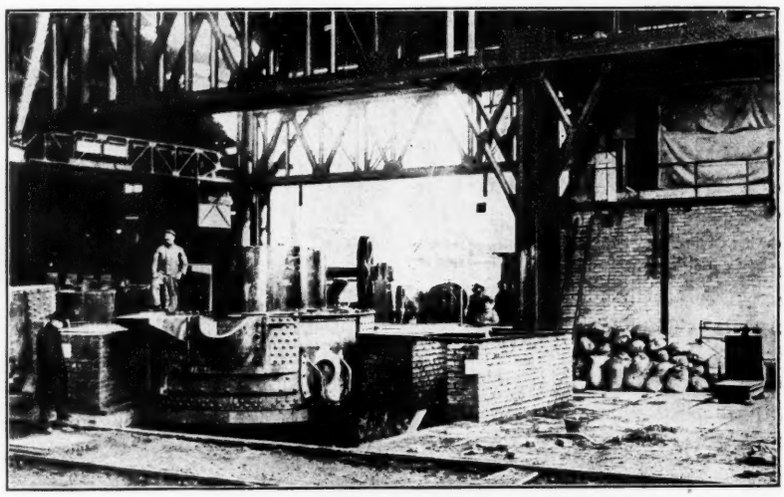


FIG. 2.—EIGHT-AND-ONE-HALF-TON KJELLIN FURNACE AT VÖLKLINGEN.

with the older methods, especially with the crucible process. The steel product is of a better quality than that formerly produced from the same raw material. The alternating current has a sort of stirring effect upon the steel so that the molten charge of the furnace becomes thoroughly mixed. When the current is applied marked movements on the surface of the molten steel are noticeable. Since the

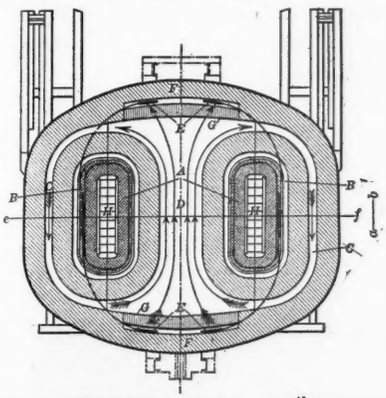


FIG. 3.—SECTIONAL PLAN OF RÖCHLING-RODENHAUSER FURNACE.

bath has a uniform cross-section throughout, the heat created by the current produces a uniform temperature in the whole bath; this removes the risk of overheating the steel in one part of the furnace and of having it too cold in another. There have been installed of the original Kjellin type fourteen electric furnaces whose charge varies from 220 to 18,700 pounds, and that have a combined charge capacity of nearly 32,000 pounds. In Fig. 2 is shown

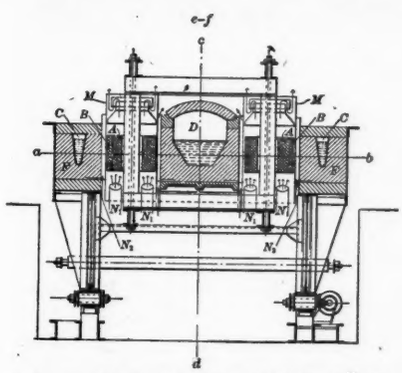


FIG. 4.—SECTIONAL ELEVATION, RÖCHLING-RODENHAUSER FURNACE.

a general view of the Kjellin furnace at Völklingen having a capacity of 8.5 tons.

The Röchling-Rodenhauser furnace is also of the induction type. A good idea of its general construction is obtained from Figs. 3, 4 and 5, which represent a single-phase furnace of this type. In these figures H-H represents the iron core of the transformer. Each leg of this core is surrounded by a primary coil A. About each of the primary circuits is a closed secondary circuit C which is formed of a channel of molten metal. These channels are joined together, forming a central hearth D. This construction gives the molten metal a section similar to the figure eight. As an auxiliary to the currents in the secondaries C there is provided about each primary coil an extra secondary coil B. The terminals of these coils B are connected to plates E which are set in the lining of the furnace. These plates are covered with electrically-conducting refractory material G that serves

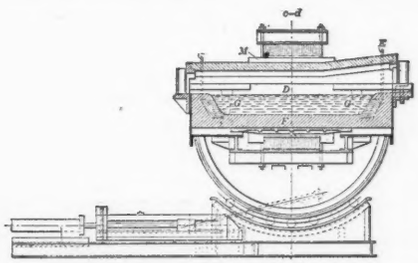


FIG. 5.—SECTIONAL ELEVATION OF RÖCHLING-RODENHAUSER FURNACE.

to protect the plates and also to distribute the current from them. In Fig. 3 the paths taken by the currents are clearly indicated by arrows. This shows that in the central hearth D there is the combined effect of the currents induced in the channels C and also those forming the portions of the secondary circuits B between the terminals E. The effect of this increased current is that the power-factor of the furnace is materially raised; thus the introduction of these secondaries raises this factor from 0.5 to 0.823. This is caused largely by the fact that the magnetic leakage field surrounding the primary coil is now used for inducing currents for the extra secondary.

The Röchling-Rodenhauser furnace was designed for the purpose of using it for the refining of fluid Bessemer steel obtained from the converters so as to produce a higher quality of rails than had been possible before and for the production of high-class steel in general. The method of operating the furnace is as follows:

After tapping, fluid steel from the converters is poured into the furnace and suitable fluxes added. During the action a dephosphorizing slag is formed which is drawn off by tilting the furnace. In making rails the phosphorus percentage is reduced sufficiently in one operation, but in making the highest class steel the operation is repeated. After removing the phosphorus the carbon percentage is adjusted by adding the proper amount of pure carbon to the bath, and after this a new basic slag is formed to remove the sulphur.

The first furnace of this type was one of 3.5 tons capacity. The results from it were so satisfactory that a number of orders for steel rails were secured from the Prussian Government Railway System. In order to adapt these furnaces better to the three-phase current that was

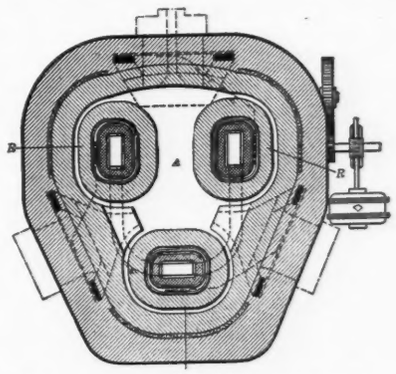


FIG. 6.—PLAN OF RÖCHLING-RODENHAUSER THREE-PHASE FURNACE.

available and also in order to raise the power-factor further, three-phase furnaces of this type were constructed. The general designs of these three-phase furnaces are shown by Figs. 6, 7 and 8. Fig. 9 shows a three-phase furnace having a capacity of 1.5 tons that is being tapped. The construction of these furnaces is similar to that of the single-phase type, except that the central hearth is in common to all of the secondary circuits and is

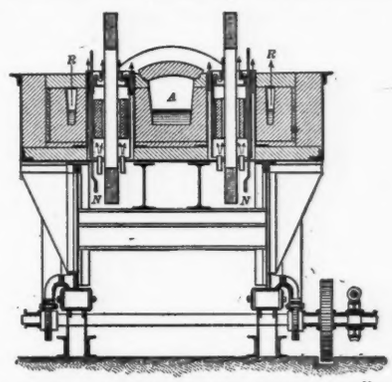


FIG. 7.—SECTIONAL ELEVATION OF RÖCHLING-RODENHAUSER THREE-PHASE FURNACE.

therefore traversed by a multiplicity of currents.

The output of various sizes of these furnaces varies from 9,000 to 65,000 pounds per twenty-four hours with cold charge and from 35,000 to 246,000 pounds in hot charging. The average time is three-and-one-half hours for a cold charge and one hour and twenty minutes for a hot charge. Basic Bes-

semer steel charged into a furnace can be finished for rails with a power consumption of 100 to 125 kilowatt-hours per ton, or to the highest quality of steel with 300 kilowatt-hours per ton. A detailed table of costs for a seven-ton three-phase Röchling-Rodenhauser furnace on the assumption that power costs 0.58 cent per kilo-

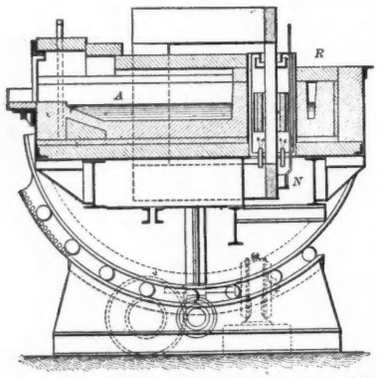


FIG. 8.—SECTIONAL ELEVATION OF RÖCHLING-RODENHAUSER THREE-PHASE FURNACE.

watt-hour shows that the total cost of electrically refined Thomas steel for use in steel rails is $18.67 per ton, or for the production of soft boiler-plate steel is $19.78 per ton. These costs include all the original materials, power, wages, linings, as well as fixed charges on the plant. A 3.5-ton furnace at Völklingen has produced more than 5,000 tons of steel rails per year, and an eight-ton furnace at the same plant has averaged about 600 tons of steel for rails per week, the lining averaging two weeks. The specifications for these rails were very rigid and the product has more than met requirements.

Argentine International Exhibition.

An extension of time is announced for applicants for space at the Argentine International Exhibition, already announced in these columns as lasting from May to November, 1910. Delegates abroad may ask for space up to August 10 next, or up to September 10 when the application is made in Buenos Aires.

Liberalizing Street-Railway Laws.

Governor Draper, of Massachusetts, has signed an amendment to the street-railway laws which authorizes street railways, with the approval of the railroad commissioners, to issue new securities for the purpose of providing working capital. The new law authorizes issues up to five per cent of their stock in new stock of working capital, or to issue such amount of bonds as shall not impair the security of bonds outstanding at the time application is made.

Proposed Alliance of Telephone and Telegraph Companies.

Although interests identified with the American Telephone and Telegraph Company have denied the report that the company had secured control of the Western Union Telegraph Company, the rumor that a deal had been consummated between the two companies has been persistently exploited, and it is stated that when the Western Union dividend was cut some time ago heavy buying by the American Telephone and Telegraph Company was what saved the stock from making a considerable decline.

If this should be carried out, it would be one of the most important moves ever made in the telephone and telegraph industry, as it would probably mean eventually the alliance of the American Tele-

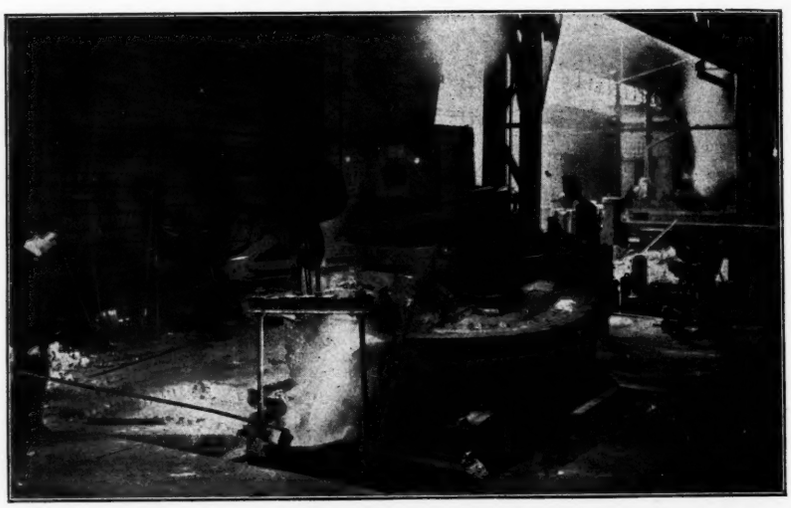


FIG. 9.—TAPPING A ONE-AND-ONE-HALF-TON THREE-PHASE FURNACE AT VÖLKLINGEN.

phone and Telegraph Company and both the Western Union and Postal Telegraph companies. The Mackay Companies, which owns the Postal Telegraph Company, is reputed to be the largest stockholder in the American Telephone and Telegraph Company and its licensee companies.

The American Telephone and Telegraph Company is primarily a holding company, holding stocks in associated operating and manufacturing companies. As an operating company it owns and operates the long-distance lines connecting all the systems of the associated operating companies with each other. According to the annual report for the year ended December 31, 1908, there were outstanding, in the hands of the public, at the close of the year 1,584,766 shares of capital stock. The balance sheet shows assets as follows:

Stock of associated companies, $235,729,305.60; bonds and other obligations of associated companies, $73,289,388.92; The capital stock outstanding is, $180,587,000; the surplus is, $16,225,917.64; depreciation reserve is figured at $21,884,159.53; the net revenue for 1908 was $18,121,707.26; out of which a dividend of eight per cent was paid, amounting to $12,459,156.

The officers of the American Telephone and Telegraph Company are as follows:

President, Theodore N. Vail.

Vice-presidents, Edward J. Hall, Bernard E. Summy, Charles P. Ware, and H. B. Thayer.

Treasurer, William R. Driver.

Secretary, Charles Eustis Hubbard.

The directors are: Charles W. Amory, Thomas B. Bailey, George F. Baker, Francis Blake, Harry H. Brigham, Alexander Cochrane, T. Jefferson Coolidge, Jr., W. Murray Crane, George L. Green, Henry S. Howe, Charles Eustis Hubbard, William Lowell Putnam, Thomas Sanders, Sylvanus L. Schoonmaker, Nathaniel Thayer, Theodore N. Vail, John I. Waterbury and Moses Williams.

The outstanding capital stock of the Western Union Telegraph Company, as given in the annual report for the year ended June 30, 1908, to the meeting of the stockholders on October 14, was $99,817,100, of which $30,131.50 belongs to and is in the treasury of the company.

The bonded debt at the close of the year was $38,645,000, divided as follows: Funding and real estate mortgage bonds due May 1, 1950, four-and-one-half per cent, $20,000,000; collateral trust bonds, due January 1, 1938, five per cent, $8,645,000; convertible, redeemable bonds,

due November 1, 1936, four per cent, $10,000,000.

The company operates 208,477 miles of poles and cables and 1,360,000 miles of wire.

The officers of the Western Union Telegraph Company are as follows:

President and general manager, Robert C. Clowry.

Vice-presidents, George J. Gould, J. B. Van Every, and Thomas F. Clark.

Secretary, A. R. Brewer.

Treasurer, M. T. Wilbur.

Auditor, J. B. Van Every.

General attorney, George H. Fearons.

The board of directors is as follows: Thomas T. Eckert, chairman; John T. Terry, Henry Walters, J. J. Slocum, George J. Gould, Samuel Sloan, Edwin Gould, Robert C. Clowry, Frank J. Gould, J. Pierpont Morgan, Charles Lanier, Chauncey M. Depew, Henry M. Flagler, John Jacob Astor, J. B. Van Every, Jacob H. Schiff, James Stillman, Thomas F. Clark, William L. Bull, James H. Hyde, Morris K. Jesup, E. H. Harriman, Howard Gould, H. C. Fahnestock, Thomas H. Hubbard, all of New York; Oliver Ames, Boston; C. Sidney Shepard, New Haven, Conn.; John J. Mitchell, Chicago; H. A. Bishop, Bridgeport, Conn.

Third Avenue Reorganization Plans.

A plan for the reorganization of the Third Avenue Railroad system, New York city, has been submitted informally to the Public Service Commission and is now under consideration. It has been prepared by the committee of bondholders of which J. N. Wallace is chairman.

Inasmuch as approval by the Commission must be secured before any plan can be declared operative, this tentative scheme was submitted to the commissioners so as to get its views on the subject before going further with the project.

It is understood that the plan involves a rather heavy assessment on the stockholders and provides for the exchange of the present outstanding bonds on a basis of part bonds and part stock in the reorganized concern. Just what the proportion will be has not been revealed. Neither has the amount of the proposed assessment on the stock, though it is believed that that will be at least twenty-five per cent.

That the Third Avenue may take over the Fifty-ninth Street Crosstown line is a possibility, but there have been no negotiations with that object in view between the owners of the two systems.

Electrical Fire Hazards.

Dealing with the electrical fire hazard, Adjuster L. S. Hayes, of Bellows Falls, Vt., reports:

"The frequency with which the obscure origin of fires is attributed to electricity, whether correctly or incorrectly, makes any definite knowledge of such ignition, or of the hazards of electricity, of interest. A few weeks ago I adjusted a small loss in a physician's office, which clearly showed its origin to have been in the coil of a small X-ray machine. The machine was of the type known as a Campbell High-Frequency Coil, 110 v., amp. 4, cycle 60, No. 353, made by the Campbell Electrical Company, of Lynn, Mass.

"The machine was set upon a narrow shelf in front of a bookcase, which had glass doors, and was connected with the city lighting company's wires by a flexible cord about four feet in length, leading from a small switch on the side of the room to the binding posts of the machine. The fire was discovered at 6:30 a. m. by a passerby. The inmates of the building were aroused and it was easily extinguished. It had communicated from the machine to the woodwork of the bookcase and cracked the glass of its doors. The gutta-percha barrel of the coil was burned off and the wires inside were melted; the binding posts burned from the wooden base and a few inches of the flexible cord destroyed. The office had been closed about twelve hours earlier, just previous to which the machine had been in use. The doctor was sure he threw the switch off between the binding posts and the coil, and thought he turned the switch at the other end of the cord when he finished using it.

"Feeling the importance of the incident, I arranged to have the machine shipped to the manufacturers just as it was found, and have followed the case by correspondence, and by two personal interviews, with the Campbell Electrical Company. They state that they 'have about 800 of these coils in use, some of them having been in use for over six years, and this is the first case of a fire that we have ever had reported. The coil had a transformer of the ordinary type, operated by a high-frequency coil through a spark gap. Evidently the doctor failed to open the switch when he left the machine, and the indications show that it caused combustion in the insulating material of the transformer. The same thing could happen to an electric vibrator, an electric fan, or almost any electrical device. It is evident that in order to prevent a repetition of this occurrence it will be best for us to equip each coil with a pilot lamp, which will remain lighted so long as the current is entering the coil. This we shall make immediate provision for, and all machines shipped after this date will be so equipped and every coil returned to us for repairs will be so equipped.'

"I do not understand that these coils, as manufactured by this firm, ever have been approved by the New England Insurance Exchange, or any other underwriting organization."

International Congress Adopts System of Uniform Weather Signals.

The American and European delegates to the commission appointed by the international meteorological committee in Paris in 1907 to consider the adoption of an international system of maritime weather signals, which is now in session in London, Eng., have adopted a uniform system by unanimous vote. The new code will necessitate changes in the existing American and European methods in signaling weather conditions, and as the United States Weather Bureau has authorized a change of signals without reference to the congress, it is expected that this international code will be adopted first at the stations on the American coast. The other nations agree to make the change as soon as the necessary legislation is passed. The commission is now considering the best means of obtaining weather reports from sea by means of wireless telegraphy from liners and warships. It may be noted in this connection that the United States Weather Bureau has for some time been urging upon navigators the expediency of transmitting, by wireless, particulars of the weather conditions at sea. While this idea has already been exploited to some extent, no concerted action on the point has yet been taken.

Try Wireless with Balloon.

The Gross airship conducted a series of experiments on June 4 over Berlin with wireless telegraphy. The apparatus was recently installed on the airship and the trials lasted for some hours while the craft maneuvered over the roofs of the city. An attempt was made to put the instruments in tune with those at the wireless land stations. The army officers who controlled the airship declined to make any statement as to the results.

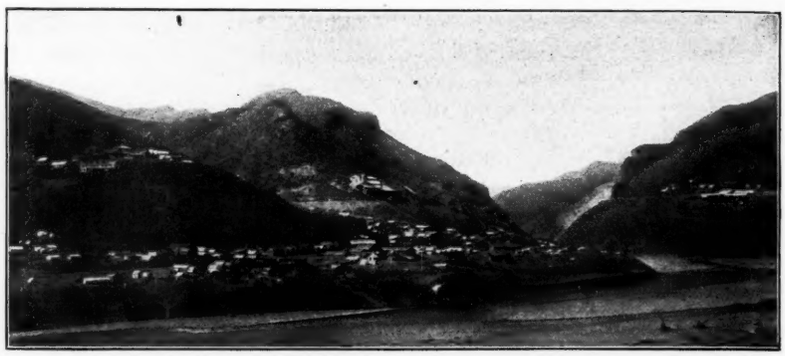
THE SALT RIVER PROJECT.

FURTHER DATA AND ILLUSTRATIONS ON THIS IMPORTANT RECLAMATION SCHEME.

In a recent issue[1] of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN a description was published of the great extent of what is known as the Roosevelt irrigation project which, when completed, will furnish irrigation to no less than 270,000 acres of arid land in the Southwest. One of the largest dams in the world is being erected across the Salt River, and this will create a reservoir holding sufficient water to flood 1,300,000 acres to a depth of one foot.

In connection with this project electricity plays a most important part, for as stated in the previous article, one of the first works undertaken in connection with the building of the dam was the construction of a power canal having a sufficient head of water to furnish a maximum electrical horsepower of 4,000 when all of the generators are installed. As soon as the canal was completed a power station was constructed supplying 1,500 horsepower for aerial transmission lines for carrying material, also for lighting the site of the dam and for operating machinery, including a large cement mill turning out 10,000 barrels of this material each month.

Owing to the isolation of the Roosevelt work from the nearest fuel supply and also from railroad facilities, electricity has been depended upon almost entirely for power. In addition, however, to the use of the current described, it is also being employed to a considerable extent for operating an elaborate pumping system, by which water is obtained from underground wells to irrigate an extensive farming district. In addition to the supply obtained from the wells, pumps are also used for obtaining water from several of the rivers in Arizona, the current being transmitted from the site of the Roosevelt dam.



ROOSEVELT, ARIZONA.
In the foreground, Roosevelt and Salt River. In the background, left to right, U. S. R. S. headquarters, cement mill, dam site, and J. M. O'Rourke & Company's camp.

The electrical installation includes a series of vertical units, General Electric generators, and S. Morgan Smith waterwheels. Three of these units are 900 kilowatts capacity, each working under a head of 226 feet. The other three units will comprise two of 900 and one of 1,500 kilowatts capacity, getting water from the reservoir under a head which will vary between about seventy feet and 220 feet. This power is transmitted to the valley below over a steel-tower transmission line carrying six wires of stranded hard-drawn copper. Where the line enters the irrigated district the wires are carried on tripartite poles of varying height, depending on the location and the size of the line and character of the country through which it passes. At a point about a mile east of Mesa a switching station is installed from which a line leads south into the pumping territory, continuing still further down into the Sacaton Indian Reservation, where about a thousand horsepower in all will be used for pumping for the Indians. The wells have been drilled and the preliminary work is now going on for the canal system into which the water will be pumped and through which water diverted from the river during flood times will be carried. Nine of these plants will be completed upon the north side of the Gila River.

About six or seven miles south of Mesa the line enters a pumping territory, and here ultimately from 20,000 to 40,000 acres will be served. The average size of the pumping units will be about fifty horsepower, varying somewhat with the location. The units will consist of a vertical-shaft centrifugal pump, direct-connected to an induction motor operating at about 220 volts, twenty-five-cycle.

The main transmission line carries 45,000 volts, and the main distributing lines

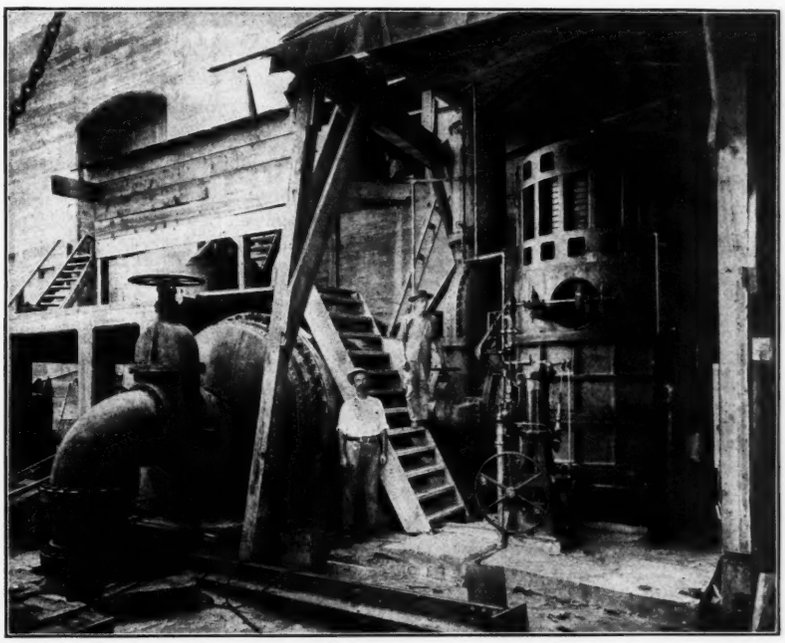
VIEW OF ROOSEVELT DAM POWER HOUSE AND TRANSMISSION LINES ACROSS THE RIVER.

SALT RIVER GORGE, SHOWING THE IMMENSE HEIGHT AND THE DAM FOUNDATION WORK.

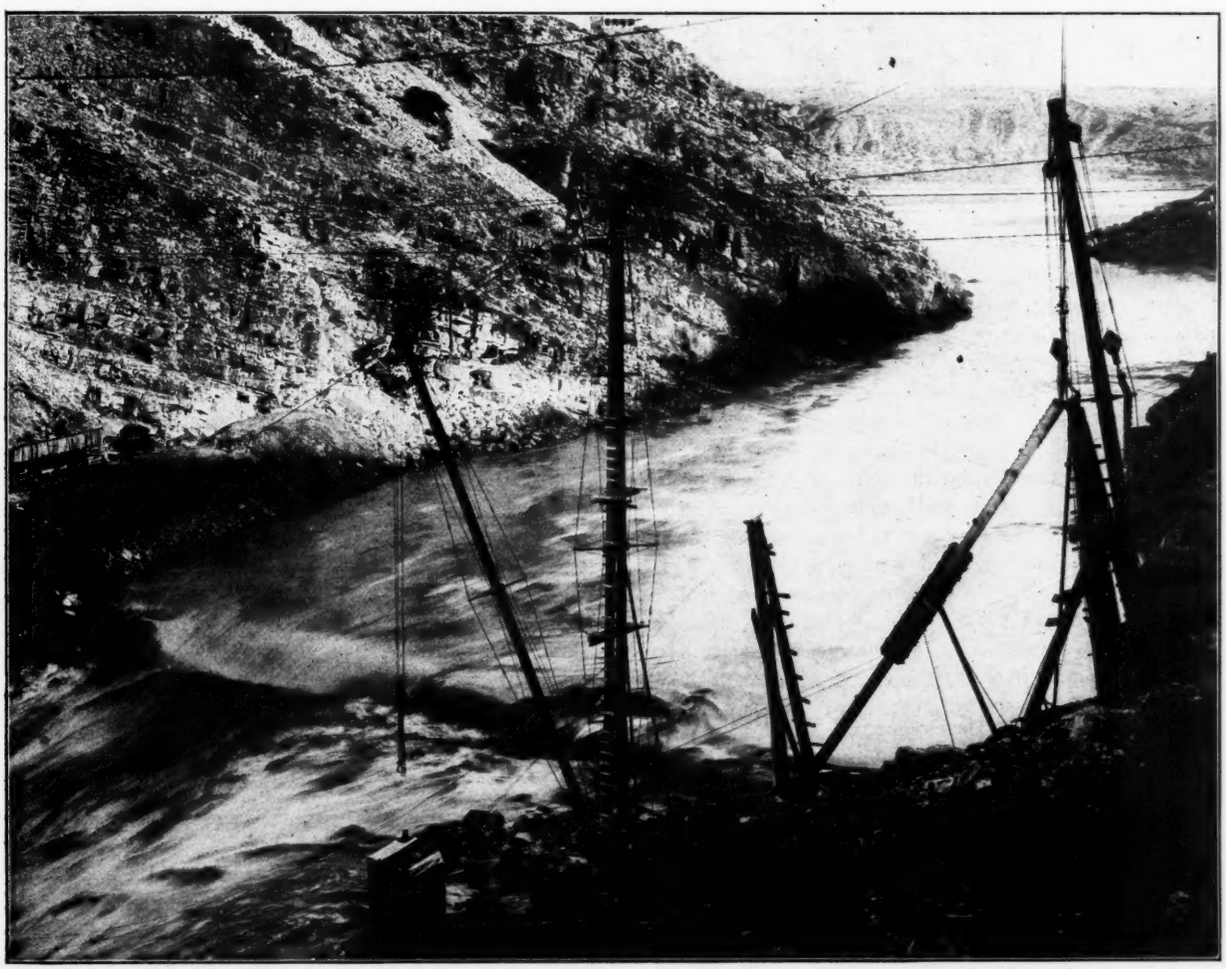
[1] Vol. 53, No. 9, pp. 316.

operate under 10,000 volts. The line previously described running south to the Sacaton Indian Reservation is a 45,000-volt line. There is a substation some eight miles south of Mesa in which the transformers change this voltage from 45,000 to 10,000. The main transmission line continues through Mesa on west, crossing the river near Tempe, and terminates at the present time in Phœnix, where power is furnished to the Pacific Gas and Electric Company at one-and-one-half cents per kilowatt-hour. This company had a contract with the original canal company controlling the canal system on the north side of the river, and the present contract was substituted for the old one.

About 500 horsepower is being used to operate the cement mill at Roosevelt, about 100 horsepower to operate the sand plant, which furnishes sand to the contractor, and he is using in the neighborhood of 400 to 600 horsepower. Various small users, such as running shops, ice plants, etc., aggregate possibly 100 horsepower more. The engineers will ultimately use in the valley for pumping between 3,000 and 6,000 horsepower, depending upon the supply of underground



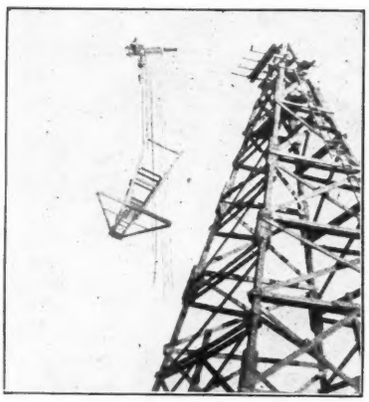
ELECTRIC GENERATOR BY WHICH POWER OBTAINED FROM THE RIVER FURNISHES CURRENT FOR CONSTRUCTING THE CONTROLLING WORKS.



VIEW SHOWING THE PIT FILLED WITH WATER AND THE MAIN CHANNEL OF SALT RIVER PASSING OVER THE MASONRY, ALSO DERRICKS PLACED ON THE BANKS DURING THE FLOOD.

water they finally develop and how deep they have to go for it. At different points on the river between the Roosevelt storage dam and Granite Reef diversion dam are sites for a number of power plants, which will ultimately be built. Further along, on the canal system, there are a number of locations where from 300 to 5,000 horsepower can be developed.

These statistics indicate to what extent the electric current is being employed at present and is to be further employed in the future; also the variety of purposes for which it is absolutely necessary. It is doubtful if anywhere in the United States electricity is serving a greater diversity of activities than in connection



TRAMWAY USED FOR CARRYING PIECES OF MACHINERY ACROSS THE RIVER.

with the Arizona project. The installations were planned and are being carried out by the United States Bureau of Reclamation according to the plans of Louis C. Hill, supervising engineer.

Radium $9,000,000 a Pound.

According to the Cleveland *Plain Dealer,* the British Radium Institute, which was founded recently by the generosity of Lord Iveagh and Sir Ernest Cassel, has given an order for seven-and-one-half grammes of radium, which will cost $150,000—equivalent to something more than $9,000,000 a pound. This is the largest order ever given. The radium will come from a mine in Cornwall.

Long-Distance Telephone Development.

A new microphone, the invention of Messrs. Egner and Holmström, two Swedish engineers, is reported to have greatly increased the range of long-distance telephony. According to a (London) *Standard* correspondent, conversation has been carried on with the aid of this new invention between Stockholm and Berlin as easily as on local calls.

"Can a Display Room Be Conducted Upon a Profitable Basis?"

Frank B. Rae, Jr., as editor, and the following assistant editors: H. K. Mohe, E. W. Lloyd, John G. Learned, George Williams and H. N. McConnell, presented this paper at the National Electric Light Association's recent convention, but the conclusions drawn were all in favor of the display room. Mr. Rae gave personal observations on the salesrooms at Chicago, Philadelphia and Rochester. The first of these cities has what is, without doubt, the most beautiful sales floor in America. Tiffany's, the world-famous jewel house, cannot boast anything more perfect. The location is one of the highest-priced corners in the city, the investment in furnishings and stock is very great, the employes are well paid. Yet this room, established less than six months, is today practically self-supporting. This company's small salesroom, an office approximately twenty feet square, located near the contract department—sells, roughly, $10,000 worth of merchandise a year. Philadelphia likewise boasts a salesroom most excellently equipped, located at a prominent shopping corner, and manned by an adequate and well-paid staff. Mr. Rae also referred to the successful efforts made along these lines by the North Shore Electric Company of Chicago. The theory of the salesroom, he observed, is generally approved, but realization of results is by no means the same thing as approval of an idea. To obtain success the following general points should be kept in mind: (1) Central location in the best shopping district. The greater part of the salesroom's custom comes from women of refinement. Go where such women are; do not expect them to come to you. (2) Attractive stock of high-class portables, and the like, is necessary. The first principle of merchandising is to attract and please. (3) Well-defined departments are essential. Keep the various classes of goods separated and show only one of each. Keep the mechanical devices in the background, but convenient when wanted. (4) Equipment must be first-class and equal to that of the best retail store in your community. Inferior and makeshift fittings mar the majority of display rooms. (5) Make good window displays. Study the windows of other stores and apply their principles. Remember that you are conducting an educational exhibit as well as a salesroom. (6) Keep interest up; not only public interest, but your own and that of your employes. There should be "something doing" every day in the salesroom. Study department-store methods here. (7) Cleanliness is imperative. A jeweler's stock should not be more spick-and-span. Keep the vacuum cleaner and the dust rag always at work. (8) Keep honest records. The books of the salesroom should be as straight as those of a retail merchant. Charge to it exactly what it costs—no more, no less. Such records will interest local merchants and contractors some day. (9) Advertise the salesroom. Make it the center for all electrical wants. Study the advertisements of other merchants and use their methods.

Railroad Electrification.

According to the *Wall Street Journal,* there has already been expended, or plans have been accepted for the expenditure of $60,000,000 in electrification work in and about New York city. This big total is contributed by four railroads, the Pennsylvania, New York Central, New Haven and Long Island. The detailed figures follow:

Railroad.	System.	Amount.
Pennsylvania		$20,000,000
New Haven	Overhead trolley	18,000,000
Long Island	Third rail	11,000,000
New York Central	Third rail	11,000,000
Total		$60,000,000

The Long Island electrification includes 105 miles in actual operation and ninety-five miles which will be completed during this year and next. The Pennsylvania's electrification is mostly terminal work in connection with the opening of its Thirty-third Street terminal. The New York Central's electrification covers about 120 miles of single track or thirty miles of four-track road from the Grand Central Station to Yonkers through the Park Avenue tunnel. This electrification will, within the next year, be pushed on toward Croton on the main line and on the Harlem division from Wakefield to White Plains.

The New Haven expenditure includes $5,000,000 spent on the electrification of eighty-eight miles of single track, or twenty-two miles of four-track main line from Woodlawn to Stamford, and the estimated cost of building 160 miles of electric single track on the new line from Harlem River to New Rochelle.

Massachusetts After Western Union.

Attorney-General Malone, of Massachusetts, is preparing to take action against the Western Union Telegraph Company on charges made by the Highway Commission that the company has failed to furnish returns of its business, in accordance with the laws of the state.

Cornell University—Commencement and Announcements.

The forty-first annual commencement was held on Thursday, June 17. In the absence of President Schurman, degrees were conferred by Prof. T. F. Crane, who retires this year from the headship of the department of romance languages. More than 225 men received the degree of mechanical engineer, including about seventy-five who have specialized in electrical engineering.

Two years ago the electrical course was improved by the addition of a junior laboratory course. The present class is the first to graduate with this complete course; namely, eight hours of required electrical work in the junior year and twenty hours in the senior year.

The benefit of the junior introductory courses in preparing seniors to attack electrical problems has been clearly shown this year. The senior problems form the main portion of the course. They consist in the prediction of the performance of electric circuits and machines when the dimensions of the various parts and the properties of the materials are given. The courses are not intended to fit students directly for practical work, but rather to show the application of electrical principles to particular fields.

The appointment of a permanent head for the department permits a rearrangement of the details. Beginning next fall there will be three main divisions of the department, each under the charge of a professor or assistant professor. The divisions are: (1) Introductory (junior) courses; (2) advanced laboratory courses; (3) advanced theoretical courses. In the junior year the same range will be covered as heretofore, but in somewhat different order. No change will be made in the required senior courses next year. The elective courses will be adapted to the needs of mechanical and electrical engineers who wish to carry their studies farther than the regular course permits. In addition to those already mentioned there will be illuminating engineering, applications of electrical machinery, and current electrical topics.

Conductivity of Fire Streams.

Experiments recently made by the Pennsylvania Railroad Company showed that there is no danger from electric shock, even from a high-voltage line, to the operator of a fire stream when the nozzle is held at a distance of upward of three feet from the wire.

Non-Resident Lectures at the University of Minnesota.

Several interesting non-resident lectures have recently been given at the University of Minnesota, Minneapolis, Minn.

R. W. Clark, of the Minneapolis General Electric Company, in an interesting and instructive talk on "Home Lighting," pointed out that for domestic lighting a well-diffused light is most effective, and this may be of much less brilliancy than that required for commercial purposes. Switches should be arranged so that a person moving about the house may progressively light the way ahead without difficulty. In conclusion, Mr. Clark called attention to the convenience afforded by a baseboard receptacle for the connection of table lamps, fans, cooking utensils, flatirons, vacuum cleaners, and other electric utilities.

A. C. Pratt, of the Missouri River Power Company, Helena, Mont., gave a lecture on "Hydroelectric Plants." A practical point in transmission is to have the transformers for the receiving end of the line wound for a pressure about fifteen per cent lower than that at the power house, thus keeping nearly all of the transformer winding in service, giving minimum iron and copper losses, and most efficient operation. The most desirable kind of load in mining districts is given by motors for pumping and crushing. The hoists give a rapidly varying load, similar to that of a street railway. Some hoists in the mine at Butte run up to 3,000 horsepower, lifting cars weighing six to twelve tons, at a speed as high as 2,500 feet per minute. At the Canyon Ferry plant, there are about six to eight short-circuits a year, caused by lightning. The trouble from lightning always originated on the plains and never in the canyons, the topmost wire being the one that usually suffered. About seventy per cent of the line troubles come from outside interference.

G. A. Anderegg, of the Western Electric Company, lectured on "The Telephone and Train Dispatching" before the engineering students and a number of railway men. The telephone has already proved successful as a substitute for the telegraph in the handling of railway trains. The objection to verbal orders has been overcome by the use of suitable record blanks and by the repetition of orders. The recent efforts of telephone engineers have been given to the perfecting of the signaling devices in order that the train dispatcher may call any station desired without disturbing others, and also be sure that the person answering is the one called. He described the various synchronizing systems and the step-by-step systems. He also described the new system recently developed by his own company, and which is believed to obviate the difficulties met with in some other systems.

Increased Traffic on New York City Subway and "L" Systems.

The New York Public Service Commission has made public the result of reports of ticket sales on the subway and elevated lines of New York city for the years 1907 and 1908, which show a remarkable increase in passenger traffic in Greater New York. The total sales on the subway and elevated systems amounted to the immense total of 494,846,348 during the past year.

The ticket sales in the subway grew from 182,559,990 in the year 1907 to 220,991,212 in the year 1908. The elevated-railroad system, however, showed a falling off, the figures for 1908 being 273,855,136, against 289,799,576 for 1907, a decrease of 15,944,440. This was due partly to the loss of passengers to the subway system, as well as to the falling off in travel due to the depression following the financial panic of October, 1907. As the subway gained 38,431,222, however, the elevated's loss was more than compensated, and the total traffic of both subway and elevated showed a gratifying net increase for the year of 12,486,782 passengers.

Some interesting sidelights on the situation are shown by a glance at the tables giving the ticket sales for each station. For instance, in 1907, the Brooklyn Bridge station of the subway sold 23,175,615 tickets, while in 1908, the sales at the same station fell off to 16,909,244. The explanation of this drop is the opening of the tube to Brooklyn, which made a difference of more than 6,000,000 tickets at the Brooklyn Bridge station. In both years, however, the heaviest sales of tickets in the subway were scored at this station.

The total sales for 1907 and 1908 on the subway and elevated systems were as follows:

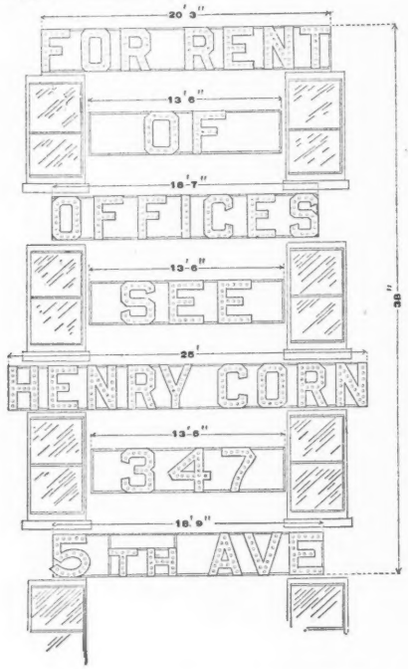
	1907.	1908.
Subway	182,559,990	220,991,217
Elevated—		
Second Avenue line	42,643,033	39,286,507
Third Avenue line	129,519,023	122,085,633
Sixth Avenue line	85,234,445	82,945,171
Ninth Avenue line	32,403,075	29,537,820
Grand total elevated	289,799,576	273,855,138
Subway and elevated systems	472,359,566	494,846,348

The sale of tickets by the McAdoo line is not given.

A Mammoth Electric Sign.

One of the largest electric advertising signs in the world has recently been erected on the premises of Henry Corn, at the northeast corner of Fifth Avenue and Forty-second Street, New York city. The over-all dimensions of the sign are: Height, ninety feet; length, twenty-five feet. The height of the letters is three feet. There are no less than 1,211 eight-candlepower lamps in the sign, thus giving a total illumination of nearly 10,000 candlepower.

The sign was designed by Benjamin Wall, of the New York Edison Company, and was built by the Metropolitan Erecting Company. The service wiring was installed by the Electric Construction and Supply Company.



The Toledo Convention of the National Electrical Contractors' Association.

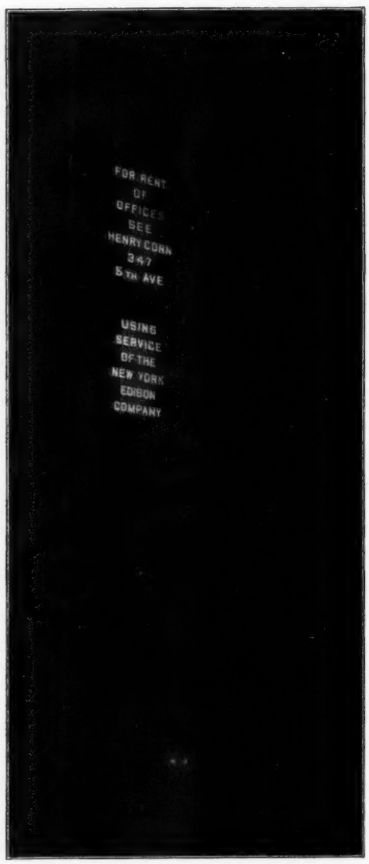
The ninth annual convention of the National Electrical Contractors' Association will be held at Toledo, Ohio, July 21, 22, and 23. There will be a series of business meetings and several open sessions, to which everyone interested in the electrical industry is invited.

The registration bureau will open at 5 p. m., July 20. On July 21 there will be an open meeting in the Chamber of Commerce rooms at 10 o'clock in the morning, with a business meeting at 2 p. m.

On July 22 an open meeting will be held in the Chamber of Commerce rooms at 10 a. m. There will be a trolley ride for the ladies at 10:30 a. m. and a business meeting at 2 p. m., the men's banquet in the Boody House banquet hall and the ladies' banquet in the Boody House parlor at 8 p. m.

On July 23 all serious matters will be laid aside and there will be an all-day outing at Sugar Island, leaving at 9 a. m. and returning, leaving the island at 5:30 p. m.

At the open session it is expected that W. H. Blood, president of the National Conference on National Wiring Rules,



MAMMOTH ELECTRIC SIGN, FIFTH AVENUE AND FORTY-SECOND STREET, NEW YORK CITY.

will address the members. Addresses are also expected from George C. Nimmons, architect, Chicago, C. L. Elliot, New York, and James R. Strong, for the National association, in addition to several other speakers.

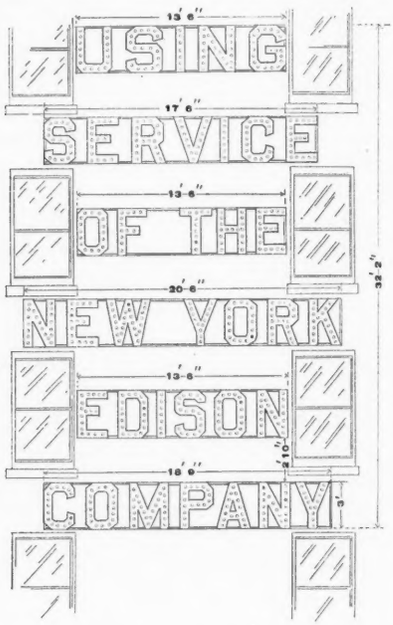
McAdoo Subway Extension.

Mayor McClellan has signed the franchise providing for the extension of the McAdoo subway from Sixth Avenue and Thirty-third Street to the Grand Central Station, New York city, thus removing every legal obstacle so far as the local administration is concerned. The only remaining step is the obtaining of consent of property owners to permit the starting of construction work.

Trolley Earnings in Iowa.

Net earnings of $84,036.93 over and above all expenses is the showing of the Fort Dodge, Des Moines & Southern interurban road during its first year of regular business. This is the electric road between Fort Dodge and Des Moines, with street-car service at Fort Dodge and at Ames. Its first annual report was filed recently with the state executive council at Des Moines.

The total gross earnings were $295,631.69, of which more than three-fourths was received from passengers. Gross passenger earnings were $225,747.17, freight earnings, $46,590.60, and express earnings, $3,089.01. Total operating expenses were $211,594.76, or $3,769 a mile, as compared with gross earnings of $5,266.91 a mile. The net earnings were



$84,036.93 for the 56.13 miles, or $1,498.18 a mile.

The Interurban Railway Company has also filed its report for 1908. It shows a decrease of $8,772.66 in gross earnings and a reduction of $10,200 in operating expenses, leaving a net earning slightly larger than that of last year. Comparative figures for the years 1907 and 1908 are as follows:

	1907.	1908.
Gross earnings	$220,099.55	$211,326.79
Per mile	3,408.70	3,272.83
Operating expenses	149,708.24	139,608.88
Per mile	2,318.54	2,162.13
Net earnings	70,391.31	71,717.91
Per mile	1,090.16	1,110.79
Taxes paid	4,823.40	6,817.84

Gross earnings from passenger business totaled $131,719.95 and from freight business $55,415.69. The figures are not reported by lines, only the totals for the system being given.

Novel Methods of Advertising in Small Towns.

Alex. J. Campbell pointed out in this paper, which was read by him at the recent convention of the National Electric Light Association, that there are two important requirements in advertising: (1) You must attract someone's attention and (2) you must convert that someone into a customer. Many methods of advertising have been employed for increasing the central-station business. In the preparation of this paper fourteen companies had contributed their ideas and experiences. Quite a number of novel methods of advertising are being made use of successfully. In newspaper advertising, for instance, scare headlines can be used to attract attention. For example, "Burglars Foiled," in large letters can be followed by a statement that a porch light left burning all night keeps burglars away from the home. Striking headlines can be made to refer to customers of the lighting company, always with a moral at the end of the tale. Under the heading, "Live Men," a list of wide-awake business men of the town who are using electric service can be made an effective advertisement. These efforts, however, must not be spasmodic. Persistent advertising is essential. A quite successful plan, which is somewhat indirect, is for the company to take a prominent part in pushing the development of its city, frequently by means of ideas and suggestions for accomplishing this without even mentioning electricity. Demonstrations are more or less useful if employed with judgment and at the right time. The giving of invitations to a select few has proven successful. Along with its possibilities novel advertising also has its dangers. Usually novel forms of advertising are short-lived. They may attract attention for a day but do not hammer home the vital facts, nor are they able, as a rule, to embody the logic that carries conviction or the persuasion that creates a customer.

The Advantages to Be Derived from Uniform Commercial Department Forms and Methods.

Clare N. Stannard, editor of a paper with the above title, read at the National Electric Light Association's convention, was aided by the following assistant editors: Henry J. Gille, A. V. Wainwright, Douglass Burnett, E. N. Writington, C. Willing Hare, E. J. Allegaert and W. A. Henderson. It advocated fullest co-operation between all members of the Association in comparing the systems employed in various companies, their manner of approaching the public, the style of advertisements, the number of solicitors employed, follow-up methods, and the like. Uniformity in the use of the best was likewise strongly advocated.

The example of members of railway associations and insurance companies should be followed. The legal and medical professions all have their uniform forms and contracts, why not the members of the National Electric Light Association? The satisfaction of the general public and increased efficiency of employes would be secured by such uniformity. Contracts should be terse, complete and pointed, and, above all else, to the point. Canvas books should reflect thoroughness and exactness; some day the rate controversy might result in uniform and standard methods of calculation at any rate. The problem of keeping prospects classified and in following them up at the proper time should be simplified. Attention was directed to the advantages of uniform methods in interior lighting, electrical display advertising and the use of electric power.

The paper in a strong, clear way then took up the importance of popularizing the business by securing publicity through press agents and high-class newspaper advertising. An organized electrical show to be held periodically at central points throughout the country was suggested, and the creation of a Board of National Electric Light Association Commercial Engineers was advocated.

Wireless Ship Law.

Senator Frye, of Maine, chairman of the Committee on Commerce, has introduced a bill providing that all ocean-going steamships carrying more than fifty passengers shall carry efficient wireless apparatus. Steamships which make trips of less than 200 miles from starting point to destination are exempted from the operation of the proposed bill. A fine of $2,000 is provided for all violations of the measure, which is to take effect one year after the date of its passage. The penalty clause of the bill contains this proviso:

"That it shall constitute a good defense to a prosecution under this act for the defendant to show that the corporations supplying efficient apparatus for radio-communication have entered into a combination for the purpose of maintaining or enhancing the rental or price of such apparatus."

Chicago's Proposed Subway.

The first supplement to the subway report prepared by City Engineer John Ericson, of Chicago, and his assistants on the construction of a comprehensive system of underground tunnels to take care of Chicago street-railway traffic has been made public. Instead of $50,000,000, as first intimated, the cost of the entire subway system is placed at $112,000,000. Exclusive of the galleries for taking care of public utilities, the cost is estimated at $95,500,000.

This subway system, according to Mr. Ericson, will take care of Chicago's traffic problem for the next fifty years. Its total capacity for passengers, both on the elevated and surface lines, will be 1,013,920 an hour.

Four tentative plans are set forth in the supplemental report, each divided into sections. The suggestion is made that work be started on the first section and that after this is completed the city continue with the next section according to convenience, and so on, until the entire system is built. The fourth set of plans provides for an entirely through-route system.

The entire plan is a series of loops within an outer belt. Milton J. Foreman, chairman of the Chicago City Council's transportation committee, will have copies of the new report prepared at once for distribution.

The plans were prepared by R. C. St. John, assistant to Mr. Ericson. He has gone fully into the question of traffic congestion, rapid transit, elimination of noise and how the subways will affect real estate values.

Mr. St. John holds that both the elevated and surface car lines have reached their maximum capacity, by reason of street congestion. In the elevated cars he has found that 48,371 persons are compelled to stand every twenty-four hours, because of overcrowding. In the same time 88,490 passengers have to stand in street cars.

The proposed subways will eliminate the elevated loop and take care of the elevated as well as the surface lines.

Electric Capstans in Dockyards.

The Devonport (England) Dockyard authorities have replaced the hydraulic bollards, which were used for warping the ships into position, by electric capstans. The motors are of sixty-five horsepower, capable of sustaining a load of sixty-five long tons.

THE COMMERCIAL DEVELOPMENT OF WIRELESS TELEGRAPHY.

ADDRESS AT MEETING OF THE NEW YORK ELECTRICAL SOCIETY, JUNE 15.

The New York Electrical Society brought its successful 1909 season to a close on the evening of Wednesday, June 16. The members met in the Sun-Parlor of the Waldorf-Astoria. The secretary's report showed that during the year the society had elected ninety-two members. There were seven deaths, twenty-five resignations, and 102 names were dropped for non-payment of dues. The year closed with a net membership of 835. The election of officers resulted as follows:

President—Theodore Beran.

Vice-Presidents — John Bottomley, Frederick A. Schleffler, Charles H. Hadlock.

Secretary—George H. Guy.

Treasurer—Henry A. Sinclair.

After the election of officers, Cloyd Marshall gave an informal address on "The Commercial Development of Wireless Telegraphy," and the station of the United Wireless Telegraph Company on the roof of the hotel was thrown open for inspection.

Mr. Marshall went over some of the early history of wireless telegraphy and gave a brief explanation of the characteristics of spark and arc methods of operations. He described in some detail the method of producing undamped oscillations and explained the features of this method which made it valuable in commercial operation. He recited the specification which the Federal Government had given out for its 3,000-mile wireless-telegraph station. Concerning the practical operation of wireless apparatus, he stated that the Signal Corps of the United States Army had various stations at the principal seaboard fortifications and along the Yukon River in Alaska and in the Philippine Islands. The Bureau of Equipment of the Navy Department operates stations in the navy yards and principal strategic points along the Atlantic and Gulf coasts, the Canal Zone, in the West Indies, along the Pacific Coast, in Alaska, Hawaii, Guam, and Manila; fifty-six government shore stations in all. These stations are used for government service and for the relief of vessels in distress, but not for regular commercial service.

The United Wireless Telegraph Company now maintains twenty-seven shore stations on the Atlantic seaboard, extending from the New England coast along the Gulf of Mexico and in the West Indies; twenty-six stations on the Pacific Coast from San Diego, Cal., up into Alaska, and seven on the Great Lakes.

The Lighthouse Board maintains wireless stations on three of the lightships. The Treasury Department maintains stations on seventeen revenue cutters, the army on six of its cableships and transports, and the navy on the principal armored vessels; one hundred government marine equipments in all.

The United Wireless Telegraph Company now operates 163 stations on shipboard. The latest list of the wireless-telegraph stations of the world, compiled by the Bureau of Equipment of the Navy Department, gives a total of 782 shore and floating stations.

The United Wireless Telegraph Company is manufacturing, installing, leasing, and selling, said Mr. Marshall, more than one complete wireless-telegraph station each working day.

The importance of the wireless for ship and shore communication, for Weather Bureau and Hydrographic Office service, in all branches of the military and naval service, and for commercial service, on land, were pointed out. Mr. Marshall also emphasized the opinion that the future held forth a promise that with the knowledge to be gained from aerial navigation and the study of earth and air currents, a great many of the present difficulties would be swept away and even greater strides made than was possible in the remarkable development of the last few years.

Third Avenue Reorganization Plan.

The reorganization plan of the Third Avenue Railroad, New York city, prepared by the bondholders' committee, was officially filed with the Public Service Commission on June 25, with a petition that a hearing be held on the matter. The commission will take up the matter at once.

The total amount of securities of the old company, stock, bonds and notes, is stated at $98,570,908, and the new securities to be issued under the reorganization plan amount to a total of about $92,000,000.

An assessment of $25 per share on the stock is provided for. Stockholders will receive 125 per cent of their present holdings in stock of the new company.

The present Third Avenue Consolidated four per cent bonds will receive eight per cent in refunding bonds of the new company for the unpaid interest and on account of the principal, twenty per cent in refunding bonds of the new company, and eighty per cent in adjustment bonds of the new company.

The syndicate will receive $5,000,000 of new bonds, $1,000,000 adjustment bonds, $20,000,000 of stock, which stock it will offer to the shareholders upon payment by them of $25 per share, and in addition provide the committee with sufficient cash to pay the reorganization expenses and other cash requirements, making a total of $7,500,000.

The properties covered by the Third Avenue consolidated mortgage are to be purchased by the committee at a foreclosure sale (unless they should hereafter decide to proceed without foreclosure sale) and the new company is to be organized under the laws of the state of New York by which the securities herein provided for shall be issued when approved by the Public Service Commission. Application has already been made to the commission for its approval.

Securities of the new company are to be $40,000,000 first refunding mortgage fifty-year four per cent gold bonds, bearing interest from July 1, 1909; $32,000,000 cumulative five per cent adjustment mortgage gold bonds carrying interest from July 1, 1909; $20,000,000 stock.

Hudson Tunnel Opening.

William G. McAdoo, president of the Hudson & Manhattan Railroad Company, announces that the downtown tunnels extending from the Hudson Terminal Buildings, New York, to the Pennsylvania Railroad station, Jersey City, will be opened for operation on Monday, July 19, at 3 p. m.

The first official train, carrying the company's guests, will leave the Hudson Terminal Buildings some time in the morning of that day. Arriving at the Pennsylvania Railroad station, the party will become the guests of Jersey City, and will participate in the exercises arranged by the authorities.

The entire tunnel system, from the Hudson Terminal Buildings to the Pennsylvania, Erie, and Lackawanna Railroad stations, will be completed and ready for operation on July 19, but failure on the part of the car builders to deliver sufficient equipment makes it possible to operate then only that portion of the line from the Hudson Terminal Buildings to the Pennsylvania Railroad station.

McCall Ferry Power Company's Reorganization Plans.

A plan for the reorganization of the McCall Ferry Power Company, in the underwriting of which prominent Wall Street houses are interested, is being opposed by some of the bondholders of the company, who feel that the interest of the holders of the company's securities is inadequately safeguarded in the scheme of reorganization, which has been worked out by the committee, of which William M. Barnum is chairman, and the other members of which are A. C. Bedford, S. Reading Bertron, Charles A. Coffin and Gardiner M. Lane.

The committee's plan in brief was to form a new company, to be known as the Southern Pennsylvania Power Company, which was to have an authorized issue of $12,500,000 five per cent bonds and $8,500,000 stock. There are $8,325,000 of bonds of the old company outstanding and to these the committee proposed to give forty per cent in new bonds and sixty per cent in new stock, while the new money was to be raised by the sale of $4,250,000 new bonds at 90, with a bonus of $3,500,000 stock. The stock, moreover, was to be trusteed until November, 1912, two of the three voting trustees to be named by those who put up the new money.

Among the points on which the dissenting bondholders criticize the plan, is that to let the old bondholders out even, who took their bonds originally at 90, it is necessary for the new common stock to sell at par. In that event those who put up the $3,825,000 of new money would realize, besides any profit on the bonds themselves, a profit of $3,500,000 on the stock before the old investors in the undertaking could as much as get back their principal. The dissenting bondholders, who are understood to command very strong financial support, believe that it is possible to form a syndicate to take a small issue of first mortgage bonds on the property, just enough in fact properly to complete the work, if the old bondholders will accept par in new preferred stock with a division of the new common stock between the present bondholders and the syndicate which would take the new bonds, the old security holders to have the right to subscribe to the new bonds, a right not offered them under the plan put out by the committee.

The McCall Ferry Power Company was engaged in the construction of a 100,000-horsepower plan on the Susquehanna River when the financial troubles of 1907 put an end to the work after nearly $8,000,000 had been spent on the property. The company had a contract to supply electric power to Baltimore, but it was not able to fill this contract. McCall Ferry, on the Susequehanna River, is within forty miles of Baltimore and about sixty miles of Philadelphia, and when completed will be in a position to supply power to both those cities as well as to many other manufacturing centers.

Space Between Chicago Street Cars to Be Enlarged.

As the result of a unanimous decision reached on June 29 by the Board of Supervising Engineers, Chicago Traction, the standard distance between track centers that had formerly been adopted as nine feet, eight-and-one-half inches was increased to ten feet, two inches. The width of all new cars to be built hereafter for the street-car systems under the control of the Board will also be reduced from nine feet to eight feet, six inches. By these changes the clearance between passing cars will be increased from eight-and-one-half inches to twenty inches on all lines to be rehabilitated hereafter. Considerable public agitation has been aroused in the last few months due to a series of fatal accidents to persons getting between the cars, and it was therefore thought advisable to make the clearance as large as the street conditions permit. The extreme width of the trackwork is limited on many lines by the width of bridges, clearance between elevated-railway columns, and minimum allowable space for vehicles standing alongside the curb line. This action does not affect those lines which have recently been rehabilitated in a thorough manner and at great cost, but it is contemplated to rebuild the wide cars to the narrower width as opportunity is afforded, thus giving at least six inches more clearance due to this feature alone. All new track construction and rehabilitation will be to the increased distance between centers.

Saskatchewan Government Purchases Bell Telephone System.

Consul-General John Edward Jones, of Winnipeg, reports that the Canadian province of Saskatchewan has followed the action of the province of Manitoba and purchased for $367,500 the Bell telephone system in the province. According to statements made by the provincial authorities, a number of important extensions will be made throughout the province.

Request for Subway Bids.

The letter of Chairman Willcox of the New York Public Service Commission to the New York City Board of Estimate and Apportionment urging that body to invite bids for the construction of additional subways in Greater New York says that the commission holds that the Lexington Avenue route, with its connections, should be the first line to be built in Manhattan and the Bronx, although other longitudinal lines will be necessary in the near future. This Lexington Avenue system is to extend from the Battery to Pelham Bay Park and Woodlawn in the Bronx, with an important crosstown connection at Canal Street.

The commission says that it was found necessary to modify original plans for the Lexington Avenue route to increase its capacity and efficiency. This change will allow double-decking between Houston Street and the Harlem River, a change not only reducing by one-half the portion of the street necessary for the subway, but providing a great increase in the capacity of the subway and reducing the cost of its construction.

"The situation has greatly changed," says the commission, "and the time has now arrived when further steps toward construction by preparation of contracts and proposals for bids should be taken. The commission has received formal and informal communications from several parties desiring to bid for construction, equipment and operation of rapid transit lines, and it believes that satisfactory bids will be obtained.

"In offering the various routes the invitations should be broad enough to permit bids on as many bases as possible in order that contracts may be awarded on the best terms."

The Public Service Commission promises that as soon as it is notified of the Board of Estimate's wishes the work of preparing contracts will be at once undertaken.

New York City Meter Report for May.

During May the New York Public Service Commission tested 27,651 gas and eighty-seven electric meters.

Of the gas meters, 53.8 per cent were within two per cent of correct, 36.2 per cent were two per cent or more fast, and ten per cent were two per cent or more slow; and of the electric meters, 85.1 per cent were within four per cent of correct; 11.5 per cent were four per cent or more slow, and 3.4 per cent were four per cent or more fast.

Annual Meeting of the American Railway Master Mechanics' Association.

The annual meeting of the American Railway Master Mechanics' Association was held at Atlantic City, N. J., June 16, 17, and 18. Reports were presented on mechanical stokers, revision of standards, and motor cars, and technical papers taking up the details of locomotive construction, locomotive performance and materials of construction were presented. In his presidential address, H. H. Vaughan reviewed the history of the Master Mechanics' Association, which was organized in 1868. Referring to the electric locomotive, he said that the master mechanics were face to face with several changes in the development of their motive power. The steam locomotive that has been supreme for so many years is finding its superiority questioned by the electric locomotive. The articulated locomotive has increased the field of the steam locomotive and enabled it to compete on more favorable terms with its younger and more powerful rival. The master mechanic should be informed of every development in this line, the results and experiences that are being obtained, and the reduction in the cost of transportation that is being realized. They should know more of electric operation, so that as motive-power officers they may be well informed as to its advantages and disadvantages, and be in a position to assist in deciding on the proper system to employ.

The report of the committee on motor cars divided these into three general classes: One, steam motor cars; two, internal-combustion motor cars; three, electric cars in combination with storage batteries or with one of the above primary movers. The report deals almost entirely with internal-combustion motor cars, but a circular of inquiry has been prepared to be sent out next year in which the electric car and the gasoline-electric car will receive special attention.

Officers for the ensuing year were elected as follows:

President, G. W. Wildin, New York, New Haven & Hartford.

First vice-president, C. E. Fuller, Union Pacific.

Second vice-president, H. T. Bentley, Chicago & Northwestern.

Third vice-president, D. F. Crawford, Pennsylvania Lines.

Treasurer, Angus Sinclair, *Railway and Locomotive Engineering.*

Members of the executive committee: C. A. Seley, Chicago, Rock Island & Pacific (two years); D. R. MacBain, New York Central & Hudson River (two years); F. W. Whyte, New York Central & Hudson River (one year).

Laclede Gas Deal Terms.

Details regarding the acquisition of the Laclede Gas Company by a syndicate headed by William Salomon & Company have been published. The syndicate, it is stated, obtained from the North American Company 74,000 shares of the company's stock out of 85,000 common shares outstanding for a price said to be about $7,215,000, which is about $280,000 more than the bid of the American Light and Traction Company. The purchasing syndicate is composed of William Salomon & Company and St. Louis interests, including G. H. Walker & Company, Adolphus Busch, A. A. Busch, W. K. Bixby, and C. H. Hittig.

Payment is to be made in cash and short-term notes, the proceeds of which will be devoted by the North American Company to the development of its other holdings.

The purchasing syndicate, it is said, owns 240,000 acres in Caddo Parish, Louisiana, and has a franchise to supply New Orleans with natural gas.

It is estimated that if the management so chooses it can connect this territory up with St. Louis at a cost estimated to be about $8,000,000.

New Haven Electrification.

Contracts for the work of electrification of the New Haven road from Stamford to New Haven have been given out, except for concrete piers between Stamford and Glenbrook. A mile of track is to be electrified for experimental purposes, chiefly for the application of electricity to the hauling of freight cars.

Interborough Wins Franchise Case.

The Court of Appeals at Albany, N. Y., has sustained the contention of the Interborough Rapid Transit Company that by virtue of its leasing the subway system in New York city it is exempt from assessment on its special franchise.

The State Tax Commission placed the value of the company's special franchise in Manhattan at $16,000,000 for 1905, and, after a hearing, reduced it to $9,000,000.

The lower courts canceled the assessment on the company's claim, and the Court of Appeals has affirmed the decision with costs.

Subways to Cost $100,000,000.

W. R. Willcox, chairman of the New York State Public Service Commission, has received from the Bradley-Gaffney-Steers Company, a series of plans and offers to construct and operate subways in various parts of New York city and Queens County, the contract costs to be over $100,000,000.

When completed, it will make a complete circuit of subways, all operated on a one-fare system, issuing transfers to and from all points. The corporation offers to build one part providing the city constructs the other, but in the event of the city's refusal, A. J. Bahn, representing the Bradley-Gaffney-Steers Company, says the company will build all if necessary. The plans run in sections:

First—A double-track subway from the Battery through Vesey Street to Broadway, then with a four-track, double-deck system, northerly along Broadway to Tenth Street, through private property to Irving Place, then north along Lexington Avenue, under the Harlem River to Mott Avenue at its juncture with One-hundred-and-forty-ninth Street, following the lines of the Broadway-Lexington Avenue subway as first planned and approved by the Commission.

Second—To run a branch along Fulton Street double-track from Ashland Street to Lafayette Avenue, then to Broadway (Williamsburg), east on Williamsburg Bridge.

Together with other plans the cost will reach $80,000,000. The part they ask the city to build would be the connecting links to the other subways, the city's cost to reach $20,000,000.

The Commission will advertise for bids for construction and operation of all or part of proposed plans, and the Bradley-Gaffney-Steers Company announces that it will be active bidders for all or part of plans submitted by it.

A. J. Baldwin, in an interview after the project was made public, said he was not in position to make public the principal backers, but they had the money and everything had been carefully planned.

Third Avenue Railroad.

Justice Ford, of the New York Supreme Court, has dismissed the complaint of the Public Service Commission against Frederick W. Whitridge, receiver of the Third Avenue Railroad Company, for the collection of a penalty for not having filed the company's report within the time specified.

The World's Cable Systems.

During the past ten years the submarine-cable lines of the world have increased by 594 cables of a length of 163,921 kilometres. The entire cable property of governments and private concerns at the end of March, 1908, according to the *Elektrotechnische Zeitschrift,* was: 1,651 government cables, of a length of 84,155 kilometres, and 402 private cables, of a length of 380,697 kilometres; that is, a total of 2,053 cables, with a length of 464,852 kilometres, of an estimated value of one-and-one-fourth billion marks ($297,500,000). The accompanying table

	1898			1908		
Country.	Owned by Governments.	Owned by Private Companies.	Total.	Owned by Governments.	Owned by Private Companies.	Total.
England (including Pacific Cable Board)..	8,900	199,847	208,747	23,219	230,679	253,898
North America (including Philippines)....	.....	50,545	50,545	7,320	85,498	92,818
France	10,781	15,376	26,157	20,702	22,413	43,115
Germany	4,127	2,059	6,186	5,866	24,301	30,167
Denmark	436	12,952	13,388	569	17,202	17,771
Netherlands	1,768	.....	1,768	5,721	.....	5,721
Japan	2,797	.....	2,797	8,084	.....	8,084
Spain	3,237	.....	3,237	3,565	.....	3,565
Italy	1,368	.....	1,968	1,989	.....	1,989
Various countries.....	3,111	122	3,233	7,120	604	7,724
Total for the world.....	37,125	280,901	318,026	84,155	380,697	464,852

shows the distribution of the cables among the various nations and the increase during the past ten years, the length of the cables being indicated in kilometres (one kilometre equals 0.62 mile).

Cut Cable Press Rates.

The committee appointed by the Imperial Press Conference, held at London, to deal with the question of cable rates, reported on June 25 that the Pacific Cable Board had signified its willingness to reduce the charges on press messages by one-half. The board understood also that the government of New Zealand was prepared to make an equal reduction on the land rate and there is reason to believe that Australia will follow suit.

Resolutions were adopted demanding that the Imperial Government increase the means and reduce the cost of cable communication with all parts of the empire, and urging upon the various governments of the empire the desirability of establishing a chain of wireless telegraph stations with the double purpose of cheapening communication and safeguarding the mercantile marine.

William Marconi, who was present, said that if considerable press work were forthcoming his company would give a press rate of two pence a word between Canada and England. It was possible to transmit twenty-five words a minute across the Atlantic, and he hoped soon to be able to send fifty. He said that soon it might be possible to communicate wirelessly for 6,000 miles instead of 3,000 as now.

German Electrical Enterprise in China.

Consul Wilbur T. Gracey, of Tsingtau, transmits the following report (*Daily Consular Report 3515*) on the installation of numerous electric-light plants in Chinese cities:

"A certain German firm in China has had considerable success during the past few months in securing contracts for the erection of electric-lighting plants in several cities of the Far East. This firm, whose headquarters are in Berlin, I understand, has a branch house in Shanghai, and others in Tsingtau, Hankow, Tientsin, and the other large ports of the Far East. A full supply of electric-lighting supplies, sample plants, etc., is kept at each branch house, so that intending purchasers are able to see the entire plant in working condition. This undoubtedly is the best way to secure orders for this class of goods, and the success of the method of pushing trade by personal representatives and goods on the spot is shown by this company's recent success.

"An electric-light plant installed in Kirin recently was put up and successfully started by this German firm. The plant consists of two boilers by Borsig, Tegel, Berlin, supplying steam at 150 pounds pressure to two high-speed compound engines built by W. H. Allen, Son and Company, Ltd., Bedford, England. The engines are coupled direct to 165-kilowatt alternators supplying three-phase current at 5,000 volts, with a periodicity of fifty, which is transformed down to 220 volts for consumers, the alternators having been manufactured by the German firm mentioned. The exciting dynamos are mounted on an extension of the crankshaft.

"In February the same company also inaugurated the electric light at Soochow, a city of 40,000 inhabitants, and this station is now regularly supplying current to consumers. In this plant there are three Krupp Lancashire boilers seven feet three inches in diameter by thirty-one feet long, with dished ends and corrugated flues, supplying steam at 150 pounds to two open-type Schickau engines running at a speed of 250 revolutions per minute. These engines have fourteen-inch and twenty-three-inch cylinders, with a stroke of fourteeen inches, and are arranged with a jet condenser and air pump worked from the low-pressure crosshead. The engines are coupled direct to German 175-kilowatt alternators, generating three-phase current at 2,200 volts, the area of distribution being less than in Kirin. Current is transformed down for consumers to 220 volts. The number of lamps is increasing daily.

"The same German company has also secured the contract for lighting Mukden, Manchuria, a city of 180,000 people, and the initial installation will consist of one 250-brake-horsepower Belliss engine and one 350-kilowatt dynamo."

Steam Versus Electric Traction.

At a recent lecture at the Royal Institution in London, Prof. W. E. Dalby compared steam and electric traction for main lines. The latter scored on the question of speed and pulling power, inasmuch as the tractive force was only limited by the number of axles on which motors could be equipped. The only drawback was the expense. If a speed of about fifty-five miles an hour was high enough, the steam locomotive was, as far as knowledge had gone at present, the most economical apparatus that could be used for comparatively long-distance working. But if a speed of 100 miles an hour was considered necessary, then recourse must be had to electric traction, though the passengers must be prepared to pay from two to three times the fares charged on the steam roads.

Illinois Central May Lower Rates.

The Illinois Central is compiling statistics regarding the amount of suburban traffic and the average fare paid with the view of rearranging, reducing and standardizing its suburban rates in connection with the proposed electrification of its suburban service. There is a possibility that even though electricity should not be installed, the company may decide to make a five-cent fare to Woodlawn and Hyde Park and any other points where there is competition from surface lines.

The reduction of suburban fares to the five-cent basis by the Southern Pacific out of San Francisco in connection with the ferry established the lowest suburban fare and built up the biggest suburban service of any road and made the department one of the most remunerative of the entire passenger service.

Canadian Electrical Association.

The nineteenth annual convention of the Canadian Electrical Association, of which a skeleton report was made in these columns last week, will be recorded as one of the most successful meetings the association has yet held. About 175 delegates were in attendance. The convention was held at the Chateau Frontenac, Quebec, Can., on June 16, 17, and 18. The Wednesday morning session was opened by an address of welcome from Sir George Garneau, Mayor of Quebec, following which President W. N. Ryerson presented his annual address.

PRESIDENT'S ADDRESS.

President Ryerson, after heartily welcoming the members to the convention, said, in part:

"During the past year committees have been appointed to investigate the following subjects: Grounding of transformer secondaries; meter inspection; central-station statistics; theft of electricity.

"The Board of Railway Commissioners for Canada recently drafted new rules governing wires crossing railways. These were submitted to a number of the power companies and to the Canadian Electrical Association with a view to receiving suggestions as to desired amendments. I therefore appointed a committee consisting of A. L. Mudge, Toronto; R. G. Black, Toronto; R. M. Wilson, Montreal; V. G. Converse, Niagara Falls; A. A. Dion, Ottawa; Julian C. Smith, Shawinigan Falls, Que., and P. S. Coate, Chatham, to revise the rules. A special meeting of the managing committee was held in Toronto on April 7, 1909, to receive the report of this committee, at which the secretary was instructed to recommend, on behalf of the association, certain changes in the rules as submitted by the railway commissioners. I am pleased to say that the revised set of rules has been forwarded to the association for approval and should probably be discussed at this convention.

"The proposed rules of the Board of Railway Commissioners are all matters of deep interest to members of this association and it is hoped that the reports to be presented by the committees will be full and complete and will call forth good discussion."

In conclusion the president mentioned, in passing, the depression in the electrical trade during the past year, and discussed the recent developments at Niagara.

REPORTS.

Next in order came the reading of the secretary-treasurer's report by T. S. Young.

The report of the committee on meter inspection was next presented by the chairman, A. A. Dion, of Ottawa. This committee's report was very favorable. During the year the committee waited upon the Dominion Government with a view to obtaining a reduction in the rates charged for the verification of electric-light meters. They had succeeded in having the registration fees, of from $10 to $25 for each operating company, completely abolished, and had obtained a reduction in the verification of both electric-light and gas meters aggregating $10,000 a year, with a promise of further reductions at an early date.

R. S. Kelsch's committee on the grounding of transformers recommended the grounding of all secondaries carrying a pressure of 150 volts or less, but above 150 it was recommended to be left optional. In the discussion ensuing the importance of making good grounds to water pipes (where possible) was emphasized. It was brought out that grounds should be tested when made and also from year to year as they deteriorate. Resistance tests were recommended.

Where grounds are used it was recommended to educate the public to the fact that the system is grounded. Mr. Barton, of Quebec, stated that the necessity of grounding the secondaries showed a weakness in the present distribution system. The grounding, he said, brought in a risk that was wrong. The danger lay in the transformer and should be taken care of at that point.

SYNCHRONOUS MOTORS.

A paper entitled "Synchronous Motors Used for Power Factor Correction," by B. T. McCormick, of the firm of Allis-Chalmers-Bullock, Limited, was read in the absence of the author by Percy Cole. The author, after a preliminary explanation of the terms "power factor" and "wattless factor," demonstrated by means of a diagram the components of lagging kilovolt-amperes at various power-factors, with a constant value of true kilowatts (=100 in the case chosen). It was shown that the leading current required for power-factor correction becomes relatively much greater as the corrected power-factor approaches unity. Thus it is not consistent with economy in first cost to install a motor large enough to correct completely the power-factor of a system. The percentage increase of kilovolt-ampere capacity over that required for power-factor correction with various values of mechanical load was next considered by means of curves and a worked-out numerical example. A graphical solution of the problem and a general discussion on designing of synchronous motors concluded the paper. A discussion followed.

Mr. Black, of Toronto, commented on the prevalence of low power-factor in synchronous motor units. The time to make provision for special apparatus for correction would be when making the contract with the manufacturer.

Mr. Ryerson pointed out that the prevalence of low power-factor was often due to the salesman selling too large a motor, which had to be operated underloaded, with a poor power-factor resulting. He recommended operating companies allowing a power-factor of ninety per cent without increasing the rates, but below ninety per cent a penalty should be inflicted, especially where one's transmission lines were nearly loaded.

POWER RATES FOR CENTRAL STATIONS.

In the afternoon session a paper entitled "Power Rates for Central Stations" was read for L. W. Pratt, of the Hamilton Electric Light and Power Company, by A. L. Mudge, of Toronto.

The paper was arranged under two heads: (1) Flat Rates, for which, owing to the fact that no two customers use power in the same way, it is not possible to outline an exact universal schedule of charges for power in large quantities. (2) Meter Rates. The meter system is by far the most equitable method (when properly worked out) of selling or buying power. It lends itself when combined with a sliding scale of discounts or table of fixed charges to every variety of power service. Instructive tables giving scales of prices, discounts, etc., under various conditions, with a discussion of the points involved, concluded the paper.

S. E. Doane, of the National Electric Lamp Association, Cleveland, Ohio, read a paper entitled "The Conservation of Our Natural Resources Through the Use of High-Efficiency Lamps."

A discussion on the two preceding papers followed.

A. L. Mudge, of Toronto, pointed out that amusement parks with a load on for only a few hundred hours in the year would ask for a low rate for a large load. It was not a desirable load at a low rate. There should be a "readiness-to-serve charge," unless the kilowatt rate is placed very high. A number of others quoted

their successful experience with the readiness-to-serve and an additional kilowatt-hour charge.

THE SONS OF JOVE.

E. D. Strickland, the national organizer of the Sons of Jove, was introduced to the convention and made an eloquent appeal for the association's support of that rejuvenated order.

The next paper read was "The Small Central Station and Its Practical Management," by R. J. Smith, of the Canadian Electric Water Power Company, of Perth, Ont.

R. F. Pack's paper, "Accounting for Electrical Companies," was then read and discussed, which concluded the first day's session.

ELECTROLYTIC LIGHTNING ARRESTERS.

The convention resumed at 9:30 a. m., Thursday, and the paper on "Electrolytic Lightning Arresters," by Professor Herdt and Mr. Dalemont, of McGill University, was read. Two types of arresters were described in full, the liquid electrode arrester and the aluminum cell arrester. The first consists of two metallic electrodes, either dipping in an electrolyte of high conductivity placed in an earthenware vessel or with a small air gap between the electrolyte and the electrodes. In one type, that without an air gap between electrodes and electrolyte, the cell is placed in series with air-gap arresters. In another, with an air gap between electrodes and electrolyte, no air-gap arresters are required in series, since, after breaking through the gap, the current in passing throws the electrolyte away. In the aluminum cell arrester, aluminum disks, in the form of cups covered with a thin film of oxide, are placed one on top of the other, built up in the form of a column, and are separated by insulating disks or washers. These cups are filled with an electrolyte. The whole combination is placed in earthenware jars. A number of such arresters can be placed in series in case of high line voltages. The critical voltage per disk varies from 380 to 400, depending on the voltage used when the plate formation was made.

A discussion followed.

Mr. Ryerson, formerly with the Ontario Power Company, stated that this company was the first to receive these aluminum arresters and use them on their 12,000 and 60,000-volt circuits. They were placed on a truss beside a pole with a horn gap in series. They do not require any attention to keep them in good condition. In some cases the plates and pans had flashed over, but this had been overcome by the use of oil surrounding the plates.

Mr. Lambe, of the Canadian General Electric Company, Toronto, pointed out that the secret of this arrester was the film on the aluminum plates, which seemed to have infinite resistance to 400 volts per pair of plates, but with a rush of current it opened like the safety valve of a boiler, taking off the charge brought in by lightning or direct stroke. It could take care of direct stroke and static charges in all cases. The present designs were just large enough to look after half an hour's discharge. Beyond that the heating becomes excessive. He pointed out that heavy iron tanks were also used in the work, which have the advantage of being almost indestructible, and all the live parts could be placed in the vessel, which could then be thoroughly grounded. Freezing, while not hurting the arrester, reduces its capacity tremendously.

CHOICE OF TYPE IN TRANSFORMERS.

The next item was the paper, "Considerations Affecting the Choice of Type in Transformers," by G. Percy Cole, of the firm of Allis-Chalmers-Bullock, Limited, Montreal. Mr. Cole discussed the advantages and disadvantages of the "shell type" and the "core type" of transformers. As far as weights of active materials and efficiencies are concerned, there is very little to choose between the two types. Broadly considered, the main advantage of the core type lies in the fact that the top yoke may be made removable and the individual coils easily taken out for repairs, although the time is not yet ripe to relegate the shell type to the background in view of the satisfactory work that this type is still doing every day on our high-tension systems.

The committee under the chairmanship of W. A. Bucke, Toronto, brought in an interesting report on power-plant statistics covering some fifty operating companies in Canada.

Questions and answers and discussion on business-getting proved interesting. It was suggested that the employment of ladies would facilitate the work accomplished in introducing sadirons and small domestic wares to the central-station's customers.

On Friday morning "Questions and Answers" and "Topical Discussion on the Use of Pole Transformers" brought out much interesting discussion.

William P. Flint read a paper on "Gas Engines and Plants." This paper was illustrated with slides of different gas engines and producers and a number of comparative charts.

A paper by E. P. Heaton, of the insurance department, Canadian Manufacturers' Association, entitled "Insurers and Insured, Illusions and Delusions," wound up the morning's proceedings.

ENTERTAINMENTS.

All through the convention the delegates were admirably entertained by the Quebec members of the Association. E. A. Evans, general manager of the Quebec Railway Light and Power Company, was chairman of the local committee. Special provision was made for the entertainment of the ladies.

On Wednesday evening special cars were provided by the Quebec Railway, Light and Power Company and a trip was made around the city. On Thursday afternoon the delegates were royally entertained on board the Royal Mail steamship Empress of Britain. After witnessing the different drills and inspecting the ship, refreshments were served.

On Thursday evening a trip was made to Montmorency Falls, about eight miles from the city, and the annual dinner of the association took place at the Kent House. About 150 members and their friends sat down. The visit to the Rustic Theatre was declared off, owing to the inclemency of the weather, and an impromptu programme of songs was provided by the guests.

On Friday afternoon a trip was made on the Dominion Government ice-breaker Montcalm, and the steamship Campana was visited. This latter vessel lies upon a rock fifteen miles below Quebec and has been abandoned to the underwriters.

A special band concert was provided by one of the regimental bands for Friday night and took place on the famous Dufferin Terrace beside the Chateau Frontenac.

During the convention the ladies made several trips—one to St. Anne de Beaupre, where the famous shrine is erected; a trip on the Levis County Railway, and an automobile ride. Laval University was opened to delegates on Thursday.

Metropolitan Application Denied.

Judge Lacombe, in the United States Circuit Court, on June 22, denied the application of the Guaranty Trust Company, of New York city, for an allowance of an appeal to the United States Supreme Court from the decree of foreclosure and sale of the Metropolitan Street Railway made on March 18, last.

Brooklyn Company Section of the National Electric Light Association.

The first annual convention of the Brooklyn Company Section (Edison Illuminating Company) of the National Electric Light Association took place at the Oriental Hotel, Manhattan Beach, Long Island, June 23, 1909.

This was an event of unusual significance, because it was the first convention so far held by any company branch. The idea was to spread the information and the inspiration secured by a fortunate few who were able to attend the recent Atlantic City convention of the National Association among the 250 other employes who are members of this company branch.

G. L. Knight, chairman, presided over the convention, which was attended by nearly 300 members and guests. Among these guests were W. C. L. Eglin, president of the National Association, P. H. Bartlett, president of the Philadelphia Section, Frank W. Smith and T. I. Jones of the United Company of New York and Arthur Williams, past-president of the National Association, and Messrs. Thomas and Kirkpatrick of the Queens County Light and Power Company.

The first business was the presentation of an original paper on "Subway Construction," by J. J. Leddy of the distribution department of the Brooklyn company. Then followed abstracts of various papers presented at the national convention, with original comments thereupon by various members of the section. Two papers or more were assigned to each speaker.

The presentation of these papers was made in a remarkably clear and capable manner by the following-named: G. L. Knight, P. D. Sharkey, F. H. Harrison, J. J. Leddy, E. W. Babcock, C. A. Graves, J. F. Becker, M. S. Seelman, Jr., and J. L. Wiltse. The commercial papers seemed to arouse more interest than the technical ones.

There was an especially interesting and vigorous discussion on the "Relation of Electric Vehicles to Central Stations," a paper delivered by J. T. Hutchings, of Rochester, at the national convention and reviewed by Mr. Graves. It was this paper that stimulated the Brooklyn Company to new and energetic effort toward placing a larger amount of this desirable type of business on its system, and Mr. Becker made the announcement that more business of this kind had been secured during the past week than in the entire previous year. W. W. Freeman, vice-president of the company, also spoke on this subject, indicating to those present the possibility of helping the work along in this direction.

"The Development of Revenue from Existing Customers" and "Methods of Introducing Tungsten Lamps, and Their Effect on Central-Station Income," were other subjects that aroused a more than ordinary degree of interest, though every paper was discussed, and a number of ideas of real value presented to the convention by different employes. Among those who took part in the discussions were Messrs. Becker, Wiltse, Thurling, Leitner, F. W. Smith, Sharkey, Ashe, Shrugue, G. E. Brown, Babcock, Cohen, Seelman, Jones, Reid, Wegner, Disque, Wells, Walton, Yeager, Leddy, Stephens, Graves, Gillman, Wood, Morris, and Wessel.

Dinner was served at 6 o'clock in the Oriental, and an evening session followed. During this session a strikingly original and scholarly address was delivered by Caryl D. Haskins, of the General Electric Company. Mr. Haskins' address was reminiscent, contemplative of present conditions, and prophetic as to the future. He indicated the remarkable progress that has been made in the electric-lighting industry in the last twenty years, and prophesied a still more brilliant future.

The convention adjourned after electing the following officers and committees for the ensuing year: Chairman, J. F. Becker; vice-chairman, F. W. Harrison; secretary, E. A. Baily; treasurer, F. C. Hill. Executive committee: W. Wickert, G. L. Knight, J. W. Lafferty, F. W. Leitner, F. J. McCormack, E. J. Magrath, A. G. Paulsen, F. E. Richards, A. W. Welch, H. P. Wood, W. F. Wells, and W. W. Freeman. Question Box committee: H. P. Wood, G. E. Brown and P. D. Sharkey. Editorial committee: E. W. Babcock, J. J. Carboy, F. E. Richards, M. J. Shrugue, and C. E. White. Committee on meetings and papers: F. W. Morris, H. P. Pope, and J. L. Wiltse.

Tungsten Development in Nevada.

It is announced that a tungsten refinery will shortly be built on the Melvin group of tungsten claims at Round Mountain, Nevada. The only mill at present refining tungsten ores in this country is situated at Boulder, Colo. Other mills for treating tungsten ores will, if present plans materialize, be built at Murray, Ida., and at Deer Park, Wash.

New Laboratory for Rennselaer Polytechnic.

The Rensselaer Polytechnic Institute, at Troy, N. Y., celebrated the eighty-fifth year of its existence on June 15 by the opening of one of the most modern and best-equipped mechanical and electrical engineering laboratories. It is a memorial to the late Russell Sage, and the building and its contents cost over $400,000.

The president of the institute read the letter from Mrs. Sage in which she presented $1,000,000 to the institute, and the resolutions of the faculty and trustees relating to the schools of mechanical and electrical engineering. Robert W. DeForest, of New York, in behalf of Mrs. Sage, Jesse M. Smith, president of the American Society of Mechanical Engineers, and Louis B. Stillwell, president-elect of the American Institute of Electrical Engineers, spoke.

Chicago Electric Club.

At the midday meeting and luncheon of the Chicago Electric Club, held on Wednesday, June 23, E. W. Lloyd, contract agent of the Commonwealth Edison Company, reviewed the papers read before the Atlantic City convention of the National Electric Light Association.

The entertainment committee announced that the picnic would be held at Michigan City, Ind., on Saturday, July 17. Boats will leave Chicago at 10 a. m. There will be running and swimming races, a ball game, and other athletic events.

On Monday evening, June 28, the members of the club were specially invited to attend the concert of Ferullo's Band at the Coliseum Garden. A special feature of the programme was the Italian ballet.

Fewer Accidents on New York Roads.

There were fewer accidents on the railroads and street railroads of Greater New York during May, 1909, than in the same month of 1908, according to the report of the Public Service Commission. The total number of accidents show a falling off of 640, the total number of personal injuries being 402, and the total number of serious injuries, thirty-nine.

Following is the recapitulation of the report for the month of May, 1909, as compared with 1908:

	1909.	1908.
Total accidents	5,152	4,512
Total injuries to persons	3,382	2,980
Serious injuries	210	171
Killed	31	32

Magnetic Testing at the Bureau of Standards.

The Bureau of Standards, Department of Commerce and Labor, Washington, D. C., has enlarged its facilities for conducting investigations and tests of magnetic material and instruments. The Bureau has just issued Circular No. 17, which describes the character of the work in this line that the Bureau is now adapted to conduct.

Permeability and hysteresis tests are made by the ballistic method on magnetic materials in the form of round or rectangular bars, and sheets. For these tests two specimens of each sample, at least twenty-five centimetres long, should be furnished. The permissible cross-section is determined by the dimensions of the holes of the coils and yokes used. The apparatus on hand at present will receive round rods of the following diameters: Three-eighths inch, one centimetre, and one-half inch. Rectangular bars may be of any section which will pass through a hole 1.27 centimetres in diameter. Sheet metal five centimetres wide, or under, may be used. For these measurements two rods or strips of the material to be tested have their ends joined by two soft-iron yokes, so as to form the four sides of a rectangle. Each bar is surrounded by a magnetizing and a test coil. The change in the magnetic flux embraced by the test coil when the magnetizing current is altered is measured ballistically.

Tests of non-magnetic materials, such as are used for chronometers and other instruments, and feebly magnetic materials will be made. Investigations on magnetic properties at high and low temperatures can also be made. Bismuth spirals, for measurement of magnetic fields, will be calibrated. The Bureau is prepared to calibrate permeameters and other apparatus used in magnetic measurements and to make investigations on the magnetic properties of materials. A limited number of bars of carefully aged iron and steel have been prepared and will be supplied to testing laboratories and manufacturers as standards, at little more than the amount of the fee for testing.

Wattmeter tests for energy losses due to alternating magnetization are carried out upon sheet iron and steel, such as is used in the cores of transformers. A special apparatus has been designed for this purpose. This serves to determine the losses due to hysteresis and eddy currents. A curve showing the relation between the flux density in the test specimen and the wattless component of magnetizing current can also be furnished when desired. Tests to determine the aging quality of this material are also carried on. Not less than five pounds should be submitted. The losses are measured at sixty cycles and 10,000 gausses, unless otherwise specified, and the results are accurate to one per cent.

Transformers are tested for core loss under normal working conditions; and by the measurements of resistance and impedance in addition the efficiencies and regulation can be computed. For tests of instrument transformers, including measurements of ratio, phase angles, regulation, etc., the Bureau has prepared special Circular No. 20, which describes this feature of the work in detail. These circulars and other information in relation to any of this magnetic work may be obtained by simply addressing the Bureau of Standards, Washington, D. C.

Electric and Steam Railways Must Interchange.

The Indiana Railroad Commission has made an important decision relative to the interchange of passenger traffic between steam and interurban lines. At a recent hearing on a petition filed with the Commission by the citizens of Garrett, Ind., in which it was sought to compel the Vandalia Railroad Company to stop all its passenger trains at the intersection of the company's road with the line of the Toledo & Chicago Traction Company at the southern border of the city in order to allow an exchange of passengers, the Vandalia resisted the petition, but the Commission ruled that the evidence showed that it was practicable for the Vandalia to stop its passenger trains at the junction with the electric line and entered an order that, beginning July 1, the Vandalia shall stop its trains at the crossing for the purpose of allowing an interchange of passengers for a period of sixty days. If after sixty days the Vandalia company can show to the satisfaction of the Commission that the convenience of the traveling public does not demand the stopping of its trains at this point, the order will be vacated, otherwise it will remain in force for two years.

The order of the Commission has aroused considerable interest among steam-road managers, who say there is no necessity for the attempt to make such exchange general. There is a possibility of litigation over the question.

English Patent-Law Decision.

In dismissing two applications for the revocation of letters patent in England because the patented articles were not manufactured in that country as required by the recent notorious patent law, the Comptroller-General of Patents said that as a general rule a patentee ought not to be called upon to manufacture any mechanism or machine which he had not specifically described and claimed in his specification, especially when such mechanism or machine was the subject of prior patents, and was only claimed in combination, if at all, in the patent under consideration.

A "Prosperity" Proof.

According to Prof. G. D. Shepardson, dean of the electrical department of the University of Minnesota, the demand for electrical engineers is greater than the supply. All of the graduates of the electrical engineering college of the University of Minnesota have secured positions, and several jobs are going begging. The professor declares this to be a proof of prosperity, as last year, on account of the financial flurry, few of the graduates were able to find work.

The Illuminating Engineering Society of Great Britain.

The executive committee which was appointed at the inaugural dinner of the Illuminating Engineering Society of Great Britain, held in London, on February 9, has reported and the constitution and by-laws have been ratified. It has been decided to proceed actively with the building up of the organization, and a membership campaign has been initiated. The honorary secretary is L. Gaster, 32 Victoria Street, London, S. W.

Wireless Telephony Still Experimental.

In view of the recent claims made for some of the present systems of wireless telephony, it is interesting to note Prof. J. A. Fleming's conclusions on the subject. In a lecture last month at the Royal Institution in London, this eminent British electrical authority unequivocally declared that while the experimental results so far obtained in wireless telephony were extremely interesting, they had not yet passed into the stage of practical application, differing in this respect from Marconi's simple but certain system of wireless telegraphy. The professor, however, anticipated with confidence much improvement in future developments.

BOOK REVIEWS.

High-Tension Underground Electric Cables. By Henry Floy. New York, N. Y.: Electrical Publishing Company. Cloth, 136 pages (5¼ by 7½ inches), illustrated. Supplied by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for $2.

This book brings together a great deal of information which has been widely scattered, and places in the hands of engineers a compendium that should prove of value to all those interested in the subject of high-tension underground electric cables. As the author states in his opening chapter, "Knowledge or lack of knowledge of this subject on the part of the engineer in charge may determine whether an alternating or a direct current system, or high or low voltage shall be selected for a given installation, with a consequent large or small expenditure in transformer plant, elaborate switchboard, enlarged buildings, or unnecessarily heavy insulation. Lack of general information regarding recent improvements made both in the manufacture of cables and in the solution of the peculiar troubles likely to arise in the operation of high-tension cables probably accounts in a large measure for their comparatively limited use." Chapter two takes up cable records, giving the gist of considerable operating data and tabulating existing high-tension cable installations, giving the approximate miles, working voltage, condition of the neutral, size of conductor, thickness of lead sheath, character of insulation, and thickness of insulation. Chapter three deals with the advantages of underground cables. Chapter four on cable insulation takes up an interesting dissertation on dielectric stresses and a study of graded insulation. Chapter five deals with metal in cables, taking up the relative values of copper, aluminum, tin and lead. Chapter six deals with heating of cables, chapter seven with electrical formulas, chapter eight with testing of cables and chapter nine with costs. The language is extremely simple and the exemplification carried out in a lucid and consistent manner. While the author is warmly in favor of the underground system, both for reliability and ultimate low cost, the expressions are far from argumentative and the treatment gains strength by its apparent fairness.

Questions and Answers About Electrical Apparatus. By W. B. Clayton and J. W. Craig. West Lynn, Mass.: Clayton and Craig. Leather, 176 pages (4½ by 6¾ inches), 95 illustrations. Supplied by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for $1.

The second edition of this book is practically a new work in comparison with the earlier edition. The size of the volume has been reduced to more convenient dimensions and the binding changed to flexible leather, both features resulting in a handy pocket reference book. Coincident with these external changes there has been a complete revision and material increase of the contents. The subject-matter of the chapters is now as follows: Direct-current motors; induction motors; constant-potential transformers; constant-current transformers; mercury-arc rectifiers; incandescent lamps; arc lamps; meters and instruments; steam turbo-generators. The chapters on incandescent lamps and turbo-generators are entirely new. A valuable addition has been the inclusion of more than one manufacturer's apparatus in the description of typical equipments. While no attempt has been made at systematic or exhaustive treatment, it will be found that the questions discussed relate to the most frequently recurring queries about the apparatus considered. Thus the book has considerable value in making clear many interesting features, particularly of a useful and practical nature, which come up in the operation and testing of electrical apparatus.

Another New York Subway Project.

William J. Wilgus, president of the Amsterdam Corporation, called on Chairman Willcox, of the New York Public Service Commission on June 11 with a plan for the Inter-Terminal Belt Line, which the company proposes to construct and operate in New York city. Mr. Wilgus was accompanied by Edward M. Shepard, counsel for the company, and Henry J. Pierce, Jr., one of the engineers. The company wishes to build a line which will be a combination elevated and subway line, along the water front on both the North and East rivers and to run across town at Sixtieth Street. It is also planned to have a double-deck subway connecting with both the Grand Central Station and the Pennsylvania Terminal at Thirty-fourth Street. The road is designed to carry freight and passengers. Its cost is estimated at $100,000,000.

This plan is separate and distinct from the plan submitted by the same company for a freight subway which is designed to be extended through all the important business districts downtown with tunnels connecting with the New York Central, the Pennsylvania, and the New Haven railroads, the estimated cost being about $300,000,000.

Annual Meeting of the Master Car Builders' Association.

The annual meeting of the Master Car Builders' Association was held at Atlantic City, N. J., June 21, 22, and 23. An important report was presented on "The Revision of Standards and Recommended Practice." There were also topical discussions on wheel defects, application of suitable lugs to steel or steel end-frame cars for jacking up car bodies, and reports on train brakes, signal equipment, brake-shoe tests, and air-brake hose. Other reports and papers were entitled "Tests of M. C. B. Coupler," "Revision of Rules for Loading Long Materials," "Rules of Interchange," "Cast-Iron Wheels," "Splicing Sills," "Tank Cars," "Safety Appliances," "Side Bearings and Center Plates," "Freight-Car Trucks," "Painting Steel Cars," "Side and End-Door Fixtures," "Train-Pipe Connections for Steam Heat," "Classes of Cars," "Salt-Water Drippings from Refrigerator Cars," "Revision of Constitution and By-Laws," "Wheel-Mounting Pressures for Various Sizes of Cast-Iron and Steel Wheels," and "Cleaning Triple Valves and Brake Cylinders of Freight Cars to Meet Interstate Commerce Commission Requirements."

The election of officers resulted as follows: President, F. H. Clark, of the Chicago, Burlington & Quincy Railroad; first vice-president, T. H. Curtis, of the Louisville & Nashville; second vice-president, L. G. Parish, of the Lake Shore & Michigan Southern; third vice-president, A. Stewart, of the Southern Railway; and treasurer, J. Kirby, of Adrian, Mich.

Edison Baseball Game at New York.

The first baseball game of the series arranged between teams representing the New York and the Brooklyn Edison companies was played on the afternoon of June 19th before 1,000 enthusiastic spectators at Visitation Oval, Lorraine and Henry streets, New York city. The Brooklyn team won a brilliant victory, the score being seven to two.

Philadelphia Rapid Transit.

City Solicitor Gendell, of Philadelphia, has petitioned the Supreme Court for leave to file a bill in equity between the city and the Philadelphia Rapid Transit Company, in the matter of strip tickets. This action is in response to a recent resolution by the City Councils, calling upon him to test the right of the company to do away with the strip tickets.

QUESTIONS AND ANSWERS.

STARTING SYNCHRONOUS MOTORS.—I would like to ask one additional point in regard to starting a synchronous motor, beyond what you imparted in the issue of June 5. It is this: In starting the motor with the field switch open, in what way does one tell when the motor is in synchronism, and when should one close the field switch? Is there any danger in closing this switch at the wrong period? —J. M. W., Portsmouth, Va.

The field switch should be closed when the motor has almost reached synchronism. There is no great harm in closing it a little ahead of time, except that it will give the motor a sudden spurt of speed, and therefore an increased rush of current. However, in order to know when synchronism has been attained, the most perfect means is by aid of a synchroscope, which is a switchboard instrument that enables one to tell exactly when two alternating-current machines are in perfect synchronism. Such an instrument was described in these columns in the issue of March 20, 1909, page 524. To avoid the expense of putting in these instruments, a method of synchronizing with lamps is commonly used. This was described in the issue of January 2, 1909, on page 31. However, it is unnecessary when closing the switch to have absolute synchronism, and it is possible to judge the approximate time by the hum of the motor, since when the motor attains what is known to be its highest speed it has reached synchronism.

AUTOMOBILE IGNITION.—I have a magneto for ignition purposes on my gasoline car, and find that I cannot run regularly below about twelve miles per hour, nor can I start the machine with the magneto. With the dry cells that I have for reserve I can start all right and also run at as low as seven or eight miles per hour. A friend of mine suggests that the magneto is not working correctly, but while going at moderate or high speeds it runs excellently. Why does it not run at low speed?—J. Z., Chicago.

The electromotive-force that a magneto generates varies practically directly with its speed. To produce an effective spark at the spark plug requires a certain minimum voltage applied to the sparking circuit. In order to produce this voltage in the sparking circuit, the magneto must run at least at a speed great enough to generate the required electromotive-force. With the dry cells a practically constant electromotive-force is supplied to the circuit; therefore, they will operate the machine regardless of speed, or, if anything, better at low speed than at high speed. Special spark plugs are now made for use with magnetos. These have a smaller gap between electrodes than those for battery ignition. By using one of these plugs a smaller voltage is needed than with the plug now in service; therefore the magneto will supply sufficient voltage at a much lower speed, probably even at starting.

RESISTANCE FOR SPARK-COIL CIRCUIT. —How many feet and what size of German-silver resistance wire shall I use to reduce a 110-volt alternating current to about ten volts and three amperes, or even less? I want to use the current on a one-half inch spark coil for experimenting.—O. E. W., Oak Park, Ill.

In order to carry as much as three amperes through a German-silver resistance coil it will be necessary to have a wire probably as large as No. 14. It will require about 500 feet of this size of thirty per cent alloy German silver. The resistance should best be wound non-inductively; that is, the wire should first be doubled, and the winding should begin at the middle point. If the resistance or impedance of the spark coil were known it might be possible to use a smaller amount of this wire. For experimental purposes it would be just as well, perhaps, to use incandescent lamps instead of a resistance coil. In this case six to eight sixteen-candlepower lamps might be connected in parallel and the set placed in series with the coil. By unscrewing some of the lamps the number that are placed in circuit can be varied, and in this way the spark length can be adjusted.

WATERPOWER.—(1) How is the available horsepower of a stream calculated? (2) What type of waterwheel is considered the best in small sizes? (3) What is the approximate cost of a waterwheel suitable to drive a fifty-kilowatt generator?—C. M., Berne, Ind.

(1) The calculation of the horsepower available from a stream is a difficult matter unless extensive data of the variation of flow for a long period are available. For this purpose it is customary to consult whatever records there may exist upon the maximum and minimum flow of the stream during what is known to have been the greatest flood and the driest season for many years. In the absence of such data, it is necessary to make a careful study of the average rainfall and the extent and character of the drainage area tributary to the stream. For small streams it is common to measure the actual flow a number of times by means of a weir. For making such measurements considerable care is necessary in order to get reliable results. The formula made use of in making the calculations of the available power is as follows, the power P being given in horsepower and assumed to be eighty per cent of the theoretical yield:

$$P = \frac{H F}{660},$$

in which H is the effective head in feet and F the average flow in cubic feet per minute. (2) Without a knowledge of the exact conditions of the proposed development, it is difficult to say what type of waterwheel would be best. The old types of overshot, breast, and undershot waterwheels are now practically out of date, and it is almost the universal custom to make use of a hydraulic turbine if the head is not in excess of about 200 feet. For greater heads, a form of impulse wheel, such as the Pelton wheel, is generally used. (3) Without knowing the type of waterwheel that is to be used an exact estimate of its cost cannot be given. Assuming that a pressure turbine for a head of some forty feet is used to drive the fifty-kilowatt generator, and assuming a generator efficiency of eighty-five per cent and an overload capacity of thirty-three per cent, the approximate cost of a 110-horsepower turbine would be $700.

HOUSE BELLS FOR ALTERNATING-CURRENT CIRCUITS.—In a large apartment building, for which I am the engineer, we have a great deal of trouble with the bells getting out of order. Usually it is on account of the batteries not working right. Could we not connect the bell circuits to the lighting circuit? We have alternating current for lights and motor pumps.—W. A. N., New York N. Y.

The trouble with the batteries now in may be that they are not large or numerous enough to provide the current required. For a large installation like this, however, the operation of the bells from the lighting circuit is frequently desirable. The bells cannot be connected direct to this circuit though, and they will all have to be changed to alternating-current bells. Polarized bells are necessary, such as are used on telephone circuits. Connection direct to the 110-volt circuit would cause the push-buttons to be burned on acount of arcing. Therefore, what is known as a bell-ringing transformer must be used to lower the voltage for the bell circuit. This has its primary coil connected to the lighting circuit and its secondary coil to the bell circuit in place of the batteries. The current taken by the transformer is very small. The installation of this system in a new building is more justified than a change in an existing building from direct to alternating-current bells.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

FONDA, JOHNSTOWN & GLOVERSVILLE.

The report of the Fonda, Johnstown & Gloversville Railroad Company for the month of May and eleven months ended May 31 compares as follows:

	1909.	1908.
May gross	$ 71,396	$ 61,326
Expenses	32,091	30,675
May net	$ 39,305	$ 30,651
Eleven months gross	704,134	713,853
Expenses	324,904	350,549
Eleven months net	$379,230	$363,304

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company for the month of May and eight months ended May 31 compares as follows:

	1909.	1908.
May gross	$ 329,339	$ 313,679
Expenses	184,147	169,723
May net	$ 145,192	$ 143,956
Charges	42,891	46,462
May surplus	$ 102,301	$ 97,493
Eight months gross	2,437,056	2,341,552
Expenses	1,524,083	1,485,623
Eight months net	$ 912,973	$ 855,928
Charges	261,757	270,571
Eight months surplus	$ 651,216	$ 585,357

CUMBERLAND TELEPHONE AND TELEGRAPH.

The report of the Cumberland Telephone and Telegraph Company for the month of May and five months ended May 31 compares as follows:

	1909.	1908.
May gross	$ 524,954	$ 503,358
Expenses	297,454	292,790
May net	$ 227,500	$ 210,568
Charges	41,110	36,107
May surplus	$ 186,390	$ 174,461
Five months gross	2,643,848	2,552,614
Expenses	1,514,125	1,489,999
Five months net	$1,129,723	$1,062,615
Charges	214,282	187,635
Five months surplus	$ 915,441	$ 874,980

LONDON UNDERGROUND.

The Underground Electric Railways of London report gross earnings for the week ended June 5 and for twenty-two weeks ended June 5, 1909, compared as follows:

	1909.	1908.
Bakerloo	£ 3,400	£ 2,910
Piccadilly	5,745	5,305
Hampstead	4,520	3,320
District	10,246	9,128
Tramways	9,655	7,843
Total	£ 33,656	£ 28,506
Twenty-two weeks:		
Bakerloo	£ 73,600	£ 67,075
Piccadilly	127,295	119,135
Hampstead	85,545	70,630
District	215,693	195,996
Tramways	125,698	131,247
Total	£627,831	£584,133

HUDSON & MANHATTAN.

The report of the Hudson & Manhattan Railroad Company for the quarter ended March 31, 1909, as filed with the New York Public Service Commission, is as follows:

Operating revenue	$202,466
Operating expenses	123,012
Net operating revenue	$ 79,454
Other income	174,021
Gross income	$253,475
Deduction	6,924
Surplus	$246,550

The reports of the Hudson & Manhattan Railroad Company for the quarters ended September 30, 1908, and December 31, 1908, as filed with the New York Public Service Commission, are as follows:

	Quarter Ended Sept. 30.	Dec. 31.
Gross operating revenues	$121,373	$189,729
Operating expenses	127,898	136,589
Net operating revenues	*$ 6,525	$ 53,140
Other income	142,419	149,806
Gross income	$135,894	$202,946
Deduction	833	9,552
Surplus	$135,061	$193,394

*Deficit.

CONSOLIDATED COMPANY, OF BALTIMORE.

The Consolidated Gas, Electric Light and Power Company, of Baltimore, has sold to Drexel & Company, of Philadelphia, and E. H. Rollins & Sons, of Boston, $3,584,500 general mortgage four-and-one-half per cent bonds of the Consolidated Gas Company, making $6,553,500 of the authorized issue of $15,000,000 outstanding.

SAO PAULO TRAMWAY.

The Sao Paulo Tramway, Light and Power Company has issued its report, for the year ended December 31, 1908, which compares as follows:

	1908.	1907.
Gross earnings	$2,287,411	$2,111,523
Operat. and maint. exp.	783,051	715,650
Net earnings	$1,504,360	$1,395,873
Charges	365,468	359,422
Surplus earnings	$1,138,892	$1,036,451
Dividends	836,538	691,476
Contingent accounts	300,000	100,000
Balance, surplus	$ 2,354	244,975
Balance, last year	656,898	.....
Total surplus	$ 659,252	.....

President Mackenzie says in part:

"The company's plant has throughout been maintained in excellent condition, and in addition the sum of $92,065, which has been charged to the contingent account referred to in last year's report, was expended for renewals and replacements. To meet expenditures of this nature, and to provide for the reconstruction of tracks, which will become necessary in connection with the general plans of the city in the way of widening streets, reducing grades, etc., the directors have thought it well to set aside $300,000 from the earnings of the year, as a definite provision for renewals, and this sum has been transferred to the contingent account opened for this purpose; $17,968 of the expenditures above mentioned has been already charged against this appropriation.

"The expenditure on capital account during the year amounted to $1,017,147. Improvements were made to the hydraulic plant at Parnahyba, an extension being made to the power house for the accommodation of units, 6, 7, and 8, and the foundation of the seventh unit, now being installed, was completed.

"The rolling stock was increased by twenty-five passenger cars and a number of passenger and freight rail cars were constructed, all of which were built in the shops of the company.

"Additions were made to the main substation in the city of Sao Paulo, and subsidiary transformer stations were erected and equipped. The light and power feeders, as well as the underground work of the system, were increased to meet the demands upon the service, and expenditure was also made on various other branches of the company's property.

"To meet the above capital expenditure the directors during the year disposed of $1,200,000 of the capital stock of the company. The premium on these shares, after deducting exchange charges, etc., amounted to $161,562, which has been transferred to the credit of reserve fund."

BUTTE ELECTRIC AND POWER.

The $1,650,000 first mortgage five per cent bonds of the Butte Electric and Power Company, recently purchased by Lee, Higginson & Company, of New York city, have all been sold.

METROPOLITAN STREET RAILWAY.

The committee of holders of the four per cent refunding mortgage bonds of the Metropolitan Street Railway Company has issued a statement saying that under existing conditions the company is not able to earn the interest charges on either the four or the five per cent bonds. In the course of its circular the committee says: "Careful and laborious examination, practical tests, tabulations and study have resulted in demonstrating conclusively that, separately operated under existing conditions, not one of the leased lines produces an income sufficient to pay its operating expenses and taxes and yield a return equal to the amount specified in the lease thereof." In most instances, it continues, "the contribution of the leased lines to the combined gross earnings of the system as a whole is greatly less than the cost of operating

and maintaining its property, and a readjustment of relations with the leased lines is essential to a proper and stable solution of the problem." The circular says: "During the last fifteen years the fare per passenger carried has been reduced from five cents to an average of practically three cents, namely, nearly forty per cent, while in less than ten years the burden of taxation has been increased fully 100 per cent." The committee concludes that the enforced transfers should be abolished and the franchise taxes reduced, or else any reorganization will be merely a temporary makeshift. The committee, however, believes that only as a last resort should the properties pledged be sold separately to satisfy the bondholders.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

The American Telephone and Telegraph Company reports for May and five months ended May 31, 1909, as follows:

May:	1909.	1908.
Dividends	$ 901,133	$ 634,964
Int. and other revenue	886,991	840,144
Tel. traffic, net	370,048	264,724
Real estate	8,584	11,742
Other sources	230,520	55,951
Total earnings	$ 2,397,259	$ 1,807,528
Expenses	213,176	151,066
Net	$ 2,184,083	$ 1,656,461
Deduct interest	546,667	647,501
Balance	$ 1,637,415	$ 1,008,960
Five months:		
Dividends	$ 7,123,915	$ 6,443,344
Interest and other revenue	4,253,942	4,136,437
Tel. traffic, net	1,744,707	1,519,627
Real estate	41,039	42,579
Other sources	719,668	301,362
Total earnings	$13,883,323	$12,443,351
Expenses	960,222	870,178
Net	$12,923.100	$11,573,172
Deduct interest	3,360,351	3,224,136
Balance	$ 9,562,749	$ 8,349,036
Dividends paid	3,333,067	3,050,560
Balance	$ 6,229,682	$ 5,298,476

Figures for 1908 include a proportionate part of the extraordinary provision for depreciation for the year 1908. Equivalent or greater provision is being made for each month of 1909.

GENERAL ELECTRIC.

The General Electric Company has issued a statement of its financial condition as of March 31, 1909, to the state of Massachusetts, which compares as follows:

ASSETS.	1909.	1908.
Real estate	$ 85,127	$ 541,900
Machinery	13,985,978	13,045,475
Merchandise	20,341,659	20,749,588
Cash and debts rec.	39,229,981	43,815,580
Patent rights	1	1
Miscellaneous	25,469,759	20,756,743
Total	$90,112,505	$98,909,287
LIABILITIES.		
Capital stock	$65,178,800	$65,169,000
Accounts payable	2,997,793	2,702,740
Funded debt	14,963,000	14,975,000
Profit and loss	15,972,912	16,062,547
Total	$99,112,505	$98,909,287

CHICAGO RAILWAYS.

The Chicago Railways Company has issued a statement of income for April, 1909, and for the period from February 1 to March 31, as follows:

EARNINGS.	April.	February 1 to March 31.	Total to Date.
Passengers	$975,440	$1,813,856	$2,789,296
Other income	21,908	42,792	64,700
	$997,348	$1,856,648	$2,853,996
EXPENSES.			
Mt. way and struc.	$ 40,702	$ 86,890	$ 127,592
Maint. of equip.	59,794	123,792	183,586
Oper. power plants	103,837	217,314	321,151
Operating cars	303,929	610,748	914,677
General expenses	116.871	206,166	323,037
Ex. ac. in real est.	5,946	8,368	14,315
Taxes (estimated)	34,178	61,880	96,058
	$665,258	$1,315,158	$ 980,416
Balance (actual)	332,090	541,490	873,580
*Balance	299,204	556,994	856,198
Ded. int. 5% on val.	171,522	328,841	500,363
Net income	$127,682	$ 228,153	$ 355,835
City of Chicago 55%	70,225	125,484	195,709
Chicago Rys.Co.45%	57,457	102,669	160,126

*Based on seventy per cent for operation.

DETROIT EDISON.

The Detroit Edison Company consolidated income account for the year ended December 31, 1908, as reported to the New York Stock Exchange, shows as follows:

Gross from operation	$1,788,812
Expenses and taxes	1,106,081
Net earnings	$ 682,731
Interest charges, etc	501,322
Surplus	$ 181,409
Other charges	34,709
Net surplus	$ 146,700
Previous surplus	75,366
Transferred from sinking fund reserve	2,146
Profit and loss surplus Dec. 31, 1908	$ 224,212

The Detroit Edison Company in its application to list on the New York Stock Exchange $7,979,000 five per cent first-mortgage thirty-year gold bonds, $5,000,000 capital stock already issued and $1,000,000 stock to be issued in exchange for convertible bonds, says that the capital stock is distributed among about 200 holders and that there is no controlling interest, syndicate or otherwise, therein.

That very close relations exist, however, between this company and the North American Company is shown by the fact that several officers are identical in both companies.

MEXICAN TELEGRAPH.

The Mexican Telegraph Company's report of estimated earnings for the quarter ended June 30, 1909, compares as follows:

	1909.	1908.
Traffic receipts	$ 165,000	$ 168,500
Expenses	41,000	35,000
Net	$ 124,000	$ 133,500
Other income	21,000	28,000
Total income	$ 145,000	$ 161,500
To Mexican government	7,500	8,000
Balance	$ 137,500	$ 153,500
Dividends	89,720	71,752
Surplus	$ 47,780	$ 81,748
Previous surplus	2,091,611	2,482,012
Total	$2,139,391	$2,563,760

CENTRAL & SOUTH AMERICAN TELEGRAPH.

The Central & South American Telegraph Company's estimated report of earnings for the quarter ended June 30, 1909, compares with last year's report as follows:

	1909.	1908.
Gross	$ 365,000	$ 408,000
Expenses	163,000	162,000
Net	$ 202,000	$ 246,000
Other income	2,500	5,500
Total income	$ 204,500	$ 251,500
Dividends	143,565	143,565
Surplus	$ 60,935	$ 107,935
Previous surplus	1,495,492	1,172,712
Total surplus	$1,556,427	$1,280,647

NORTHERN OHIO TRACTION AND LIGHT.

The report of the Northern Ohio Traction and Light Company for the month of May and five months ended May 31 compares with last year's report as follows:

	1909.	1908.
May gross	$188,749	$158,409
Expenses	103,832	94,878
May net	$ 84,917	$ 63,531
Charges	43,809	44,154
May surplus	$ 41,107	$ 19,377
Five months gross	775,738	664,298
Expenses	445,389	419,761
Five months net	$330,349	$244,537
Charges	219,074	217,043
Five months surplus	$111,275	$ 27,494

TOLEDO RAILWAYS AND LIGHT.

The report of the Toledo Railways and Light Company for the month of May and five months ended May 31 compares with the corresponding report of last year as follows:

	1909.	1908.
May gross	$ 212,835	$ 198,973
Expenses	126,611	109,444
May net	$ 86,224	$ 89,529
Other income	320	81
Total income	$ 86,544	$ 89,610
Charges and taxes	70,871	71,719
May surplus	$ 15,673	$ 17,891
Five months gross	1,085,332	1,028,607
Expenses	621,109	574,930
Five months net	$ 464,223	$ 453,677
Other income	908	2,774
Total income	$ 465,131	$ 456,451
Charges and taxes	354,651	348,374
Five months surplus	$ 110,480	$ 108,077

BOSTON SUBURBAN ELECTRIC.

The combined earnings of the subsidiary companies of the Boston Suburban Electric Companies, comprising the Newton, Newton & Boston, Lexington & Boston, and Middlesex & Boston Street Railways, and excluding the Norumbega Park and the Waltham Gas Company, for May and eight months, are as follows:

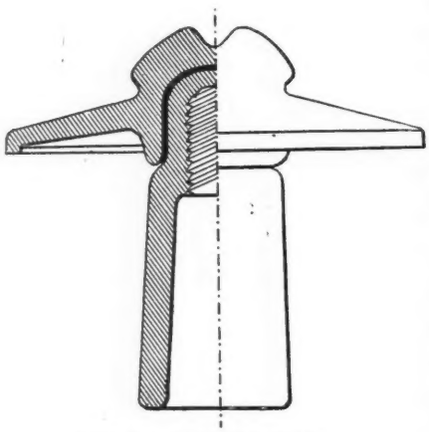
	1909.	1908.
May gross earnings	$ 74,569	$ 76,082
Expenses	50,550	54,413
Net earnings	24,018	21,669
Interest	13,520	13,270
Surplus for dividends	10,497	8,390
Eight months' gross earnings	499,855	494,664
Expenses	396,259	420,789
Net earnings	103,595	73,875
Interest	107,403	106,018
Surplus for dividends	*3,807	*32,143

*Deficit.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

INSULATORS ON LINES NEAR THE SEA.

The efficacy of insulators depends not only on their form and the material of which they are manufactured but also on the condition of their surface; and humidity, dust and smoke are detrimental to their good working. In the vicinity of the sea the salt contributes to the formation of a thick conducting layer on their surfaces, which after a while entirely destroys the insulation of the line. This phenomenon has been investigated by G. Anfossi on the Acquedotto de Ferrari Galliera line of Genoa, which transmits three-phase current under a tension of 25,000 volts to a distance of fifteen kilo-



HIGH-VOLTAGE INSULATOR.

metres. The observations demonstrated absolutely that the incrustation forms to a harmful extent only on those parts of the insulator that are protected from the wind and atmospheric action. Thus it was found that the crust of dust and salt forms most easily on the surfaces best protected from the rain, which under ordinary conditions should constitute the most efficient parts of the insulator. The usual forms are therefore not suitable for localities subject to deposits of salt, and the author has designed a new type of insulator intended to overcome this difficulty on the basis of his experiences. It comprises a large upper, almost flat bell, under which a harmful crust cannot form. Below this bell the insulator must have a shape which leaves it freely exposed to the action of the wind in order to prevent the progress of the incrustation. The lower portion therefore consists of a simple smooth or undulated sleeve, or even superposed bells, but there must be no cavities in which dust can locate. The accompanying illustration shows one of these types of insulator. The diameter of the bell is 220 millimetres; the total height of the insulator is 200 millimetres. In the laboratory they withstood a pressure of 75,000 volts when dry and 30,000 volts in a heavy rain. These insulators have been in use on the line referred to for over eighteen months with perfect success. Of course they may also be employed to advantage on lines that are not near the sea.—*Translated and abstracted from La Revue Electrique (Paris), May 30.*

AN INTERESTING GAS-DRIVEN GENERATOR SET.

The well-known firm of Mather and Platt, Manchester, England, has recently designed and built a gas-engine generator set for the East Indian Railway Company, which includes many new features. The gas engines will utilize the waste gases from the railway company's coking ovens at their Giridih Collieries. The two engines run at 167 revolutions per minute, each coupled directly to a three-phase alternator wound for 2,300 volts, fifty cycles. Each alternator has a normal output of 200 kilovolt-amperes on a power-factor of 0.75, but the sets are also capable of twenty per cent overload for two hours. The engines are of the Körting double-acting two-cycle pattern, with Mather and Platt's improvements. They are intended to run in parallel, and are particularly suitable for this, as owing to an impulse being produced at every stroke the turning is extremely regular, and the cyclic irregularity does not exceed one in 300. Each engine has two cylinders, side by side, with cranks at right angles; thus four impulses will be given to the shaft per revolution. The construction is remarkably simple, and as the flywheel is placed between the cylinders, with the field magnets of the alternator mounted on the flywheel rim, the whole arrangement is compact, well balanced, and easily accessible. Duplicate sparking plugs and ignition gear are provided for each end of the cylinders. The alternators are coil-wound, and the exciters are driven by Morse chains. To start the engines, compressed air will be used, with a compressor of special type, driven by coke-oven gas. This compressor has two cylinders—one for gas and the other for air—and delivers the air to reservoirs at a pressure of 150 pounds per square inch. The order was obtained in direct competition with both English and foreign firms.—*Extracted from Electrical Engineering (London), June 10.*

THE BRAUN ELECTROMAGNETIC RAIL-BRAKE.

This brake serves for increasing the adhesive power of the cars to the rails, thus reducing the distance for which the brakes have to be applied. While normally the adhesion of a car amounts to from one-seventh to one-tenth of the pressure resting on the wheels, it is increased twofold by using the electromagnetic rail-brake in conjunction with the ordinary brake applied to the wheels. This rail-brake, which is manufactured by Adolf Braun, of Friedenau, near Berlin, consists of a two-pole magnet, the pole-shoes of which are flat, parallel irons extending in the direction of the rails. The space between the flat irons is equal to about one-fifth of the width of the rail head. At an induction of 17,500 centimetre-gramme-second units between brake-shoe and rail-head, which is easily reached, and which corresponds to a pressure of 12.5 kilogrammes per square centimetre, a brake pressure of fifty kilogrammes per one metre of rail will be obtained. By lengthening the brake-shoes any required braking power may be produced. The Braun rail-brake is manufactured in three sizes: For six tons brake pressure at 120 centimetres length, for four tons at eighty centimetres, and for 2.5 tons at fifty centimetres. The total weight of the brake amounts to three per cent of the brake pressure exerted. The medium-size brake consists of two double magnets capable of a pressure of 4,000 kilogrammes each. The magnet windings, which are made on forms, are protected by steel casings. This brake is particularly suitable for mountain railroads, and for street railways it has been developed into a combined rail and wheel brake. In

the latter case a lever transmits the pull of the rail-brake to the brake-shoes acting on the wheels.—*Translated and abstracted from Zeitschrift des Oesterreichischen Ingenieur und Architekten Vereines (Vienna), June 4.*

PROTECTION OF TELEPHONE INSTALLATIONS AGAINST THE DISTURBING INFLUENCES OF HIGH-TENSION ALTERNATING CIRCUITS.

Various methods have been proposed and tested for reducing the disturbances that occur in telephone installations, when the telephone circuit is exposed to the electrostatic or electrodynamic influence of high-tension alternating-current lines. Nearly all of them attempt to solve the problem by a suitable arrangement of the line wires, but the results have not been entirely satisfactory in all cases. Martin Hoechstaedter proposes the employment of a protective circuit at each installation for eliminating those disturbances that have not been prevented by the use of known methods of building the line itself, so that it will be as free of disturbances as possible. The simplest way of preventing the electromotive-force still present from sending a current through the telephone without noticeably weakening the telephone currents is undoubtedly the insertion of a condenser of suitable capacity in the telephone circuit. An idea of the size of condenser required may be gained from the following rough calculation: The disturbing frequency is assumed to be fifty per second and the average sound vibration 1,000 per second; it is also assumed that for fifty periods an alternating-current resistance of 60,000 ohms is sufficient to render the disturbance harmless. As a condenser of one microfarad has an apparent resistance of 3,000 ohms for a current of fifty periods, a condenser of 0.05 microfarad proves to be necessary. For 1,000 periods this condenser has a resistance of approximately 2,000 ohms. At the beginning of the experiments it was feared that the employment of such small capacities might have an injurious effect on the clearness of speech, but experience showed that the insertion of condensers of 0.05 and even 0.03 microfarad in an ordinary circuit with a good granular microphone rendered the speech decidedly more distinct. It was found that the microphones could be operated with double the tension at which cracking ordinarily occurred. The method was practically tested with good results along a 10,000-volt polyphase transmission line thirty kilometres long. The condenser was supplemented by a choking coil of suitable size in parallel with the telephone receiver.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), June 3.*

ELECTRIC MINE HOISTING.

In the further development of the Denaby Main Colliery, in Yorkshire, England, electricity is playing an important part. The hoisting machine, which will lift 140 tons per hour, is operated by an electric motor designed for a peak load of 700 horsepower and a mean load of 340 horsepower at 392 revolutions per minute. Three-phase current at 3,000 volts and forty cycles a second is used. The speed can be regulated for inspection purposes by means of the controller which controls the motor under normal conditions. The brake gear is operated by compressed air from a motor-driven air-compressor, which is automatically controlled by the variation of the air pressure. Among the safety devices is a solenoid in the main motor circuit, which trips the emergency brake when the current fails. Other safety devices trip this brake when the attendant fails to cut off the current in approaching the top, when the motors reverse, and when the air pressure in the compressor falls below a certain point. When the brake is tripped a triple pole switch in the stator circuit is automatically opened. The whole of this plant stands on a concrete bed of thirty feet by twenty-eight feet, with a headroom of but nine feet, on the 1,380-foot level. The shaft is fourteen feet in diameter and extends to a further depth of 780 feet. The bedplate weighs twelve tons and was constructed in sections for being brought down the mine.—*Abstracted from The British Trade Review, June 1.*

ELECTRICAL CONDUCTIVITY OF PURE HEXANE.

Some interesting particulars are adduced in a recent paper by G. Jaffe in the *Annalen der Physik* on the electrical conductivity of pure hexane. The pure hexane can be obtained from the better electrically conducting impure material by electrolysis and by repeated distillation. The resulting product has a practically constant conductivity about twelve times that of air under the same conditions. The pure hydrocarbon has, however, only one-third of this conductivity when the measuring vessel is sheathed with lead so as to cut off external radiations, and even this is influenced by the material of the containing vessel, aluminum, for instance, giving very low values. Other remarkable properties are that the current is practically constant at varying temperatures and that an increase of potential from 200 to 2,000 volts produces no increase in the current, which reaches a saturation value analogous to that of a gas, although at a much lower voltage.—*Abstracted from Nature (London), June 3.*

MERCURY MOTOR-METERS.

No meter has been brought out for continuous-current supply to equal the mercury motor-meter in simplicity and accuracy. It, no doubt, has faults and failings which worry the supply engineers, but still it has held its own against all others; its manufacture is a large business, and must be carried on upon a factory system with perfect organization and special plant to make it a paying business at current prices. The makers may, therefore, be credited with having reduced its construction to the simplest and cheapest design. George Hookham's name will always be associated with this class of meter, as will that of Ferranti. The original meters of these two inventors represent the two classes of mercury motor-meters, into which they may be divided. The Hookham meter, broadly considered, is a motor-generator, a magneto-motor driving a generator with a short-circuited armature. The original Ferranti meter belongs to another class, wherein there is no magnetic brake; it is not a motor-generator, but simply a series motor, working against the fluid friction of the mercury. In the new Ferranti Company's meter (Hamilton's patent) we have the idea of employing one disk to act as motor and brake between two or more separate poles. As made, there is one pair of poles for driving and one pair for braking. As a matter of fact, both act as brakes, and so it is, in this case also, difficult to account for the compensating effect of the series coils. To the writer (Rankin Kennedy) it seems that a separate brake is desirable, as it gives the power of easy compensation and adjustment of speeds without electrical shunts. A portion of the current is sometimes shunted past the mercury bath in order to adjust the speed. This is not a safe practice, as any change in the mercury bath or the contacts immediately alters the rate of the meter. The subject is one worth consideration and discussion.—*Abstracted from The Electrical Review (London), June 18.*

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Two New Hydraulic Jacks.

Anyone who has much heavy lifting to do appreciates that there are pleasanter tasks than carrying around a jack from one place to another, especially when it weighs more than a hundred pounds. It means rather a heavy load if carried by hand, and if the jack is loaded and reloaded onto a truck with each using, this involves considerable work too.

The new Watson-Stillman shop jack, shown in Fig. 1, renders unnecessary much of this labor. This jack, made in eleven sizes, of from twenty to fifty tons capacity, and lifts of twelve and eighteen inches, fills all the ordinary requirements of lifting heavy machinery and for general shopwork. The wheels on the base and the handle on the cylinder facilitate moving the jack quickly from one place to another without the exertion of a great deal of energy. The wheels touch the floor only when the jack is tilted, so they are never in the way during the lifting operation. If it is desired to use the jack at an angle, it can be tilted in the opposite direction to the wheels, and when it is laid flat upon the side, the ram will push out its entire lifting length. An independent steel claw (not shown in the illustration) can be used when desired for lifting from near the ground. This is more convenient than a permanently attached claw, as the independent part is easily applied when a low lift is required, and its removal at other times allows the jack to be made of considerably lighter weight. The weight, however, is comparatively small, because the whole jack is made of steel, and the parts under greatest strain, such as the ram and cylinder, are machined from a solid bar of high-carbon steel.

FIG. 1.—SHOP JACK.

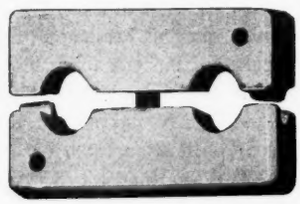
It is sometimes inconvenient to work the lever of a jack of the internal-pump type because of the lack of room, or insufficient footing. To meet these conditions, the Watson-Stillman Company has put upon the market the independent-pump hydraulic jack shown in Fig. 2, which is furnished in fifty-three sizes, of from two to 1,200 tons capacity. The various sizes of the jack proper have maximum ram movements of from four to eight inches. The pump is connected to the jack by means of flexible copper tubing, which may be of any length suitable to the work in question. The jack may be operated up to a pressure of 450 pounds per square inch on the ram by means of the hand lever shown on the pump, and further worked to full capacity by means of the extension lever. The gauge may read in pounds per square inch, or in tons load upon the jack, or both. This is not furnished when the jack is to be used for ordinary lifting, but is necessary in testing. When equipped with the gauge, the jack may be used between two fixed platens for making compression tests, testing the tightness of force, fits, etc.

FIG. 2.—INDEPENDENT-PUMP JACK.

Both of the above jacks are made by the Watson-Stillman Company, of New York, and are able to stand a considerable overload without danger of injury to the operator or jack.

The A. S. A. Lamp Cord Adjuster.

The accompanying illustration shows a new lamp-cord adjuster which has been placed on the market by the A. S. A. Manufacturing Company, Westfield, N. J. This adjuster is made of hard white porcelain and is entirely free from burrs or rough edges. It is not necessary to remove the socket to attach the adjuster, as the two portions are held together by a spring. Alinement is effected by means of an offset fitting into a groove on opposite sides of each of the halves of the adjuster. In attaching to the lamp cord all that is necessary is to draw the two halves apart, give them a slight turn, insert the cord and spring the halves back into position. There is a small hole in either end of the adjuster to enable it to be suspended from the ceiling or any other place.



THE A. S. A. LAMP CORD ADJUSTER.

Telephone Receivers for Wireless Transmission.

In designing telephone receivers for wireless work, many points must be attended to in order to attain the desired degree of sensitiveness. Contrary to general belief, high resistance of the coils does not necessarily mean great sensitiveness; rather, the coils must be wound so as to give the greatest number of turns with the least resistance, so that for maximum efficiency there must be the greatest possible number of turns of wire nearest the cores for a given resistance.

Other points which also greatly affect the sensitiveness are the amount of iron in the cores, the quality of this iron, the thickness and diameter of the diaphragm and the quality of the iron from which this is made, and the strength of the permanent magnets. The magnets must be designed with due regard to the cores and diaphragms with which they are to be used. All the parts mentioned must, moreover, be mounted on a substance entirely unaffected by heat or moisture, in order to secure permanence of adjustment.

The wireless operator's head receiver, illustrated herewith, which is made by the Holtzer-Cabot Electric Company, of Brookline, Mass., has been designed to give the maximum degree of comfort with which such instruments can be worn, besides keeping all the above points carefully in view. The spools and magnets are mounted in a metal cup which supports the diaphragm, and the windings are all of silk-covered copper wire. These magnets are made of special quality steel and of such a strength as to give the best results with the diaphragms used. Adjustment is made permanent by grinding the cores to an exact proper height, and the metal cup referred to above is enclosed in a hard-rubber shell. The receivers are mounted on an adjustable leather-covered head-band on which there is nothing to work loose or to catch the hair. The large detachable pneumatic rubber cushions which are provided with each set not only shut out interfering outside noises, but also materially increase the comfort of wearing.

WIRELESS TELEPHONE RECEIVER.

These sets may be wound to resistances up to 4,000 ohms. A six-foot two-conductor green silk tinsel cord is supplied with each set.

A Big Submarine Telephone Cable Consignment.

On June 8 last the Western Electric Company shipped the first sections of submarine telephone cable designed to connect San Francisco with Oakland, by way of Goat Island, beneath the waters of San Francisco Bay. The cable was two-and-seven-eighths inches in diameter, containing sixty-nine pairs of telephone wire, twenty-six pairs of No. 13 Brown & Sharpe gauge, and forty-three pairs of No. 19 Brown & Sharpe gauge. On the big reel the first section, 4,250 feet in length, weighed twenty-six-and-one-half tons.

FIVE-TON TRUCK, CONVEYING HUGE CONSIGNMENT OF CABLE.

The truck on which this cable was hauled weighed about five tons, and sixteen horses dragged the heavy load. The wagon was built very low, with a clearance of only eight inches between its lowest part and the ground. Guiding eight teams of horses through the streets of New York and around the narrow corners is an unusual sight as well as a difficult task, and many stared at the cavalcade as it made its way along Bethune Street from West Street to Eighth Avenue, thence up to Twenty-seventh street and west to the river, where the freight dock of the Lehigh Valley Railroad is located.

The second consignment, of 4,250 feet, left the Western Electric Company's factory in the same manner two days later.

The first two sections of this cable, 8,500 feet altogether in length, are to extend from San Francisco to Goat Island. When the other two sections of 7,800 feet arrive, they are to be stretched from the island to Oakland Mole. On Goat Island connection with the land cable is to be made. The entire 16,300 feet of cable is one of the largest orders for paper-insulated submarine telephone cable ever placed. The cable is consigned to the Pacific Telephone and Telegraph Company.

A Simple Method of Comparing Intensity of Illumination.

The increasing use of high-efficiency tungsten lamps in connection with reflectors or shades has created a demand for some simple method by which the intensity of light derived from two sources can readily be compared.

The average photometric measurement method is not well adapted for use by a layman who does not care to know, as a rule, the intensity of a source of light or an illumination in terms of a standard, but simply desires a visual comparison which will indicate which source gives the brighter light without knowing just how much brighter one source is than the other.

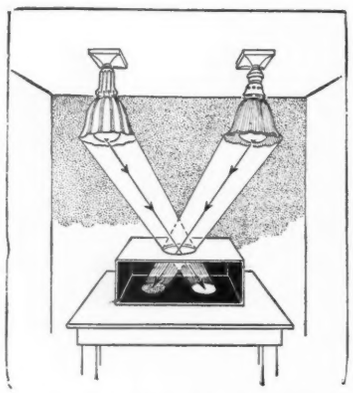
A simple practical method of comparing the intensity of illumination has been worked out in the fixture studios of the Central Electric Company, Chicago, Ill., and a short description of the method may be of interest to the central-station solicitors and others called upon to dem-

onstrate lighting effects to the ordinary consumer.

The method is simply one of comparison, the two sources to be compared being located approximately as shown in the illustration, in which the intensity of the light reflected from one source is being compared with the intensity of the light reflected from another source.

The usual practice is to mount two sockets and shade holders approximately four feet apart on the ceiling of the fixture or display room and equip each holder with the desired shade, care being taken to have the sockets connected to the same source of supply in order to operate the lamps under the proper voltage conditions. Care should also be taken to select lamps having approximately the same watt consumption in order to secure a fair comparison.

The measuring or comparing device is placed on a table, and consists of a rectangular box provided with a round hole in the top, this hole being so located that



DEVICE FOR COMPARING INTENSITY OF ILLUMINATION.

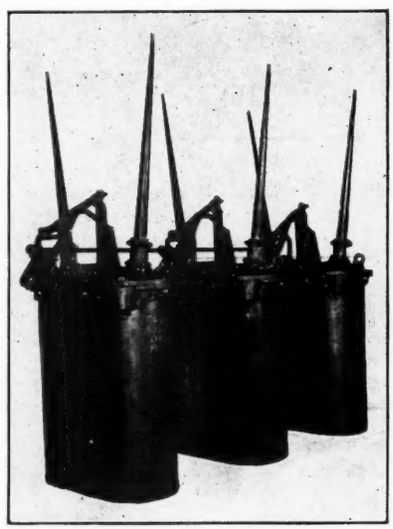
a ray of light emitted from either of the lamps will throw a light spot on the horizontal shelf, on which is placed a piece of white paper. As will be seen from the illustration, one side of the box is left open, so that an observer can readily see the interior.

With two sources of light located as shown in the diagram, two light spots are thrown on the white paper, and it is an easy matter to select the brighter spot. It should be remembered that the light rays cross; that is, the light from the left lamp is thrown to the right-hand side of the measuring device.

Westinghouse Type GA Condenser-Lead Circuit-Breaker.

The recent revival of several large power developments which had been held up for financial reasons, and the rapid extension of existing systems, have led the Westinghouse Electric and Manufacturing Company to develop and place on the market a heavy capacity oil circuit-breaker.

This new type GA breaker consists of single-pole units, each enclosed in its individual boiler-steel tank with separate operating mechanism, leads, etc. All the operating parts are mounted on the cast-iron top and are operative on the top so that the mechanism may be lined up before it is dropped into the oil tank. Eye bolts are provided for handling this top as a unit. Since the connection between poles is simply a piece of three-fourth-inch gas pipe, the poles may be spaced any convenient distance apart. The pipe is used as a pull rod, being in tension only. It is impossible for the different



WESTINGHOUSE TYPE GA CONDENSER-LEAD CIRCUIT-BREAKER.

poles to stick, due to improper alinement, as they may be placed several inches out of line without making the angle of pull sufficient to jam the mechanism.

The breaker is made for four voltages —44,000, 66,000, 88,000 and 110,000 volts. It may be either hand or solenoid operated and of any number of poles. The automatic circuit-breaker is furnished either for use with series transformers or with a self-contained series trip. Time-limit features may be incorporated if desired.

The breaking capacity is practically unlimited, the heavy boiler-steel tanks and cast-iron top giving great strength against internal pressures. The total travel of the moving contacts is large, there being two breaks in series at each pole. Each break takes place in a separate compartment, separated from the other pole by double barriers of insulating material. The break is between brass and copper, materials which have been found to give the best protection against burning. Each moving contact piece has its own heavy steel spring to take up any wear due to arcing and slides across the stationary piece with a rubbing motion, keeping the contacts bright. The insulation features of this breaker are probably superior to those of any device of its character ever designed. While this is in a great measure due to the condenser type of lead, as will be explained, in any type of apparatus the insulation is dependent on the number of paths to ground, or, in other words, the number of insulation points. It will be noted that in this form of circuit-breaker there are only three such points, namely, the two leads and the wooden rod. The rod, being of moderate cross-section, can be easily and thoroughly dried and impregnated and is well immersed in oil at all times, so that its factor of safety is large.

The condenser type of lead marks probably the greatest advance in high-tension work that has been made for some time. The problem of carrying a high-tension conductor through a grounded surface has been one of the limiting factors in developing higher voltages. Due to the fact that it was impossible to maintain the same stresses in all layers of insulating material, on account of the unequal distribution of potential in them, excessive amounts of insulation were required to secure safety. It was even found necessary to remove all grounded material from the neighborhood of the conductor, and various further makeshifts have been used, such as oil-filled terminals, double or triple porcelains and excessive amounts of varnished cloth or paper. In the Westinghouse type G breaker, which is regarded as the standard for 66,000-volt transmissions, providing the protection for both the Niagara and Southern Power Company lines, heavy soapstone tops, varnished cambric leads, and expensive and cumbersome porcelains were required. The contrast in the type GA breaker is surprising. A moderate-sized lead made up of alternate layers of tinfoil and insulation is fastened solidly into cast-iron flanges, and at voltages far in excess of that required to break down former constructions these leads show no static discharge or other evidences of strain.

The development of this condenser lead has been carefully worked out, expensive machinery for producing it having been installed, and every point in connection

with its manufacture is thoroughly covered by patents.

That this breaker is appreciated is shown by the fact that the Westinghouse company has supplied, or has orders for at the present time, over 200 single-pole units for 44,000, 66,000 and 110,000-volt lines, and has other large orders in immediate prospect.

High-tension operators and engineers appreciate fully the simplicity, rugged construction and large factors of safety of this device.

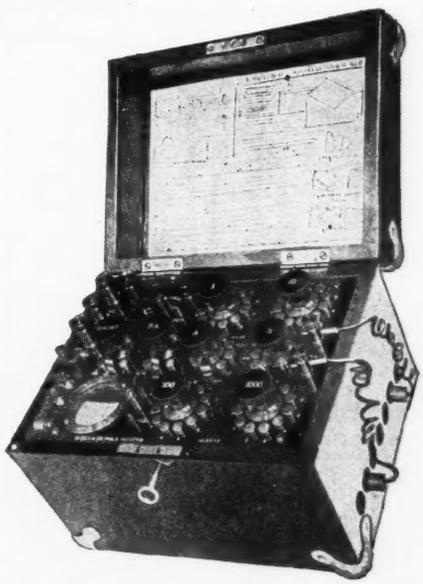
A New Dial Decade Testing Set.

The illustration herewith shows a new type of portable testing set. This set is very small and compact, measuring but nine-and-one-fourth inches long by seven inches wide by seven-and-one-half inches deep and weighing about eleven pounds. It is equipped with a new form of rheostat, consisting of four complete dials of ten coils each, of the capacity of units, tens, hundreds, and thousands, and so arranged that the revolving laminated brush may be changed from the highest to the lowest coils without revolving backward over the intermediate contacts, thereby saving considerable time in the manipulation. The bridge arm "A" has coils of 10, 100, 1,000 and 10,000 ohms and also a block "infinity" or no resistances. The "B" arm has coils of 10, 100, 1,000, and 10,000 and also a zero block, which short-circuits "B" side when its switch is on zero. It will thus be seen that a very wide range is allowed.

The type of brush designed for this set is of the tripod form, with two legs of the tripod resting on the central contact ring, thus doing away with the annoying and variable stud contact as usually made in switch-type sets. The third leg rests on the block, as indicated by the position of the brush. It will be noticed by this arrangement that no flexible lead or variable stud can enter into the resistances of the rheostat or bridge. Each of the necessary switches and binding posts are plainly marked and are conveniently arranged that the operator may quickly make Wheatstone bridge, Murray and Varley loop tests for insulation measurements, and numerous other tests.

The scale on the galvanometer is calibrated uniformly, making the readings for insulation uniform throughout the entire range of the scale. The resistance coils are wound with manganin wire, of zero temperature coefficient, properly shellaced and baked, and the resistance, therefore, requires no correction over very wide ranges of temperature. The galvanometer is of the D'Arsonval type, with a long, narrow coil, securing thereby a high sensibility with dead-beat action.

The magnets for these galvanometers are made of the finest grade of magnet steel, carefully aged and tested, and are permanent and uniform. A specially arranged Ayrton shunt allows the galvanometer a very wide range of application, making it possible to allow full current to go through the galvanometer or one-tenth or one-one-hundredth part of the same. An outside galvanometer may be used when an instrument of very high sensibility, higher than that furnished in the set, is desired.



NEW QUEEN DIAL DECADE TESTING SET.

Keys are in series with both battery and galvanometer circuits and are so arranged that they can be kept locked down when it is desired to make permanent contact by means of a thumb-nut at the back of the strap, or both keys may be depressed with the same finger, when necessary. Provision is made by means of binding posts so that the set may be used with an outside battery of higher electromotive-force than that furnished with the set, when stronger battery power is needed.

The battery consists of six special dry cells mounted in the base. The terminals of these batteries extend through the side of the case, but the ends of the tips are below the outer edge of the case, so that they cannot become short-circuited. For the renewal of the batteries it is only necessary to remove four small screws from the base of the case. These open the cell compartment, and the battery can be renewed without soldering or rewiring any connections. This cell compartment is made entirely separate from the rest of the case and securely sealed, there being no danger, when changing the battery, of getting any dust or dirt into the interior of the set, or around the galvanometer or resistance coils.

The card of direction in the lid describes the connections of the set and also the diagram of the wiring as used in the different tests, together with printed descriptions and formulas. The case is of polished mahogany, highly finished, with nickel-plated corner straps, thus protecting the case from injury.

This set is being placed upon the market under the name of the Queen Dial Decade Set by Queen and Company, of Philadelphia, Pa.

Electrical Manufacturers at the Exhibit of the Railway Supply Manufacturers' Association at Atlantic City.

In connection with the conventions of the Master Mechanics' Association, which was held at Atlantic City, N. J., June 16, 17, and 18, and the Master Car Builders' Association, June 21, 22 and 23, the Railway Supply Manufacturers' Association made an extensive exhibit. Among the electrical manufacturers participating in this exhibition were the following:

Adams & Westlake Company, Chicago, the Adlake-Newbold axle electric car-lighting system, and electric and gas fixtures.

American Blower Company, Detroit, Mich., motor-driven blowers for forges and furnaces, and mechanical draft apparatus.

Carborundum Company, Niagara Falls, N. Y., carborundum wheels, sharpening stones and abrasive material.

Consolidated Car Heating Company, Albany, N. Y., heating and signaling systems.

Consolidated Railway Lighting and Equipment Company, New York, N. Y., standard electric train-lighting equipments.

Cooper Hewitt Electric Company, New York, N. Y., Cooper Hewitt lamps for shop and train lighting.

Dearborn Drug and Chemical Works, Chicago, method of scientific treatment of boiler feed water.

Joseph Dixon Crucible Company, Jersey City, N. J., Dixon crucible graphite paint for steel cars, and Dixon lubricating material.

Duntley Manufacturing Company, Chicago, vacuum cleaners.

Electric Storage Battery Company, Philadelphia, Pa., storage batteries for car lighting, signal, vehicle and ignition service.

General Compressed Air and Vacuum Machinery Company, St. Louis, Mo., Thurman portable electric vacuum cleaner.

General Electric Company, Schenectady, N. Y., gasoline-electric car and reception booth.

Gold Car Heating and Lighting Company, New York, N. Y., car heating and lighting equipment.

H. W. Johns-Manville Company, New York, N. Y., asbestos packing, roofing, pipe-covering cement, Vulcabeston and magnesia products.

Kerite Insulated Wire and Cable Company, New York, N. Y., samples of underground and submarine cables, railway wire and Kerite tape.

Safety Car Heating and Lighting Company, New York, N. Y., axle-driven electric-lighting equipment and lighting fixtures.

Watson Insulated Wire Company, New York, N. Y., insulated wire.

Westinghouse Automatic Air Brake and Steel Coupler Company, St. Louis, Mo., automatic air brakes and steel couplers.

Westinghouse Air Brake Company, Pittsburg, Pa., triple-valve test rack and operative centrifugal dirt collector, air compressors, pumps, hose couplers and auxiliaries.

Westinghouse Machine Company, Pittsburg, Pa., turbine train-lighting set and electric storage batteries for railway use.

Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., turbine train lighting sets, motors, arc lamps, incandescent lamps, blowers, ventilating fans, and measuring instruments.

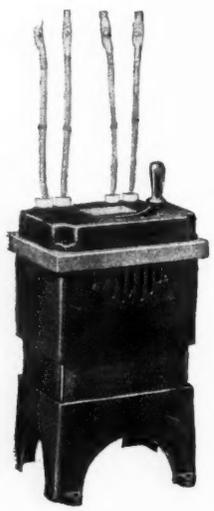
Yale & Towne Manufacturing Company, New York, N. Y., electric hoists, triplex chain blocks, I-beam trolleys, padlocks, door jacks and kindred hardware.

The "Compensarc" for Motographic Machines.

The need of some kind of a device for controlling arc lamps on moving-picture machines is obvious when it is known that moving-picture machine arc lamps operate at approximately thirty-five volts at the arc, while the voltage obtainable from practically all commercial lighting circuits is either 110 volts or 220 volts. Some electrical device must of necessity, therefore, be used between the line and the lamp to take care of the difference in voltage. Formerly iron-wire or grid resistance rheostats were used. Their use, however, resulted in a waste of all that energy supplied from the line over and above that actually required by the lamp. Progressive managers are now using "Compensarcs" instead of rheostats, and thus save all that amount originally wasted.

The Compensarc, therefore, must of necessity be invaluable to all moving-picture theatres operating their arc lamps from alternating-current circuits. The Compensarc cannot be used on direct-current circuits. It is in reality a special type of adjustable auto-transformer.

The great saving in power resulting



THE "COMPENSARC."

from the use of the Compensarc, with the superior quality of light in color, intensity and stability, makes it a prime favorite with all moving-picture men who have tried it.

The Compensarc, illustrated herewith, is known as type A, form 4, and is rated at two kilowatts for 110 volts, or two-and-one-half kilowatts for 220 volts, and wound for either sixty cycles or 133 cycles, as may be desired.

The general appearance of the Compensarc is clearly shown in the illustration. The core is made of the highest grade sheet-steel laminations, similar to standard transformer construction. The outer surface of the core is fully exposed to the air. The coils are mounted within the core and are completely protected and thoroughly insulated. Core and coils are given vacuum treatment, making them completely waterproof.

The assembled core and coils are supported by a cast-iron base having four legs, which hold the Compensarc at a convenient height from the floor. The case is also of cast-iron and rests on the top of the core. It is liberally ventilated and encloses the ends of the coils and protects the connections on the inside. A slate top supports the switch blade and clips. The slate top, case and base are securely held together by four long, heavy bolts, one passing through each corner of the slate top, case and base outside the core.

A horizontal, three-step, continuous-circuit switch is mounted on the slate top, providing three adjustments for intensity of light. Each adjustment is so designed that it maintains approximately the same voltage at the arc while passing from one step to the next, without at any time opening the circuit. There is no waiting for the arc to settle and become steady before the intensity of the light can be determined. The Compensarc increases or decreases the intensity of light without a flicker.

A cast-iron cover over the slate top completely encloses the switch blade and contacts, making it impossible for accidental short-circuits to occur, and also removes all danger to the operator. The terminals to the line and lamp are brought out through porcelain insulators in the cover.

The Compensarc has a neat and symmetrical appearance, and is extremely simple to operate—one hand on the switch handle controls everything.

The Compensarc is approved by the fire underwriters. There is positively no fire risk, as there is no noticeable rise in temperature, even after several pictures have been run through the machine.

The Compensarc is very substantially made and maintains its usefulness indefinitely. It cannot be short-circuited. Even when the switch blade is at an intermediate point, and thus bridging two adjacent contacts, it will not burn out. The adjustments possible with the Compensarc are very essential to successful moving-picture work and the fact that the Compensarc provides these adjustments without breaking the circuit and putting out the light makes it all the more desirable.

The Fort Wayne Electric Works, Fort Wayne, Ind., which manufactures the Compensarc, claims a saving of two-thirds on lighting bills for moving-picture arc lamps by its use.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JUNE 19.—For quite a number of years past the electrical industry in Great Britain has been suffering from the great unwillingness of capitalists to invest money in undertakings at home, whereas the obtaining of capital for foreign and colonial electrical enterprises has been a comparatively easy matter. There are a number of opinions as to the real causes of this state of affairs, the remedy for which has been variously put at tariff reform, the reform of Parliamentary procedure in the promotion of bills, and the stringent revision of the powers now possessed by local authorities. With regard to the difficulty in finding capital for launching new electric-lighting and tramway enterprises probably the latter is the most vital factor, for the veto possessed by local authorities has been used somewhat mercilessly in many cases. But whatever the actual cause may be in every individual case, the fact remains that the city people are decidedly reluctant to take up electrical enterprises at home. A determined effort is now to be made with the view of altering this unsatisfactory state of affairs and an influential meeting is being arranged to be held in the city, probably presided over by a member of the royal family, with the object of interesting the "city" in the possibilities and merits of home enterprises. In order to do this, of course, some relaxation of the present parliamentary restrictions upon private promoters will have to be sought, and it is conceivable that a deputation will eventually wait upon the government to this end. Following this meeting, it is also probable that an electrical industrial association will be formed whose objects will be to endeavor to bring about a relief of the unhappy condition of the industry generally which has now existed for several years.

The committee of representatives of London electricity supply undertakings, both company and municipal, has now been finally agreed upon, and a set of preliminary rules will be drawn up with a view to arriving at a working basis for linking up all the undertakings for the purposes of mutual supply. In this way it is hoped to shut down a number of very uneconomical stations which it has hitherto been necessary to work in consequence of the policy of dividing London up among so many supply authorities.

The working expenses upon the Griffiths-Bedell surface-contact system at Lincoln for the past financial year show a better result than the average of seventy-five municipal systems working upon the overhead system, viz., 5.60d per car mile against 6.37d per car mile.

Since the Home Office some years ago deemed it wise to appoint an electrical inspector of factories, in consequence of the increasing use of electric power in industrial works, the annual reports dealing with the year's work have always been both practical and interesting. The report for 1908 has just been issued, and shows that there were only twelve fatal accidents entirely due to the electrical apparatus installed, while there were also only two fatal accidents in generating stations on works. Portable apparatus, as usual, is the cause of the majority of the accidents, and electrical manufacturers are urged to give greater attention to this. In this connection the electrical inspector makes the suggestion that the wires of a plug should be connected to the plug in such a way that they do not pass through the hands of the person holding it. No less than fifteen accidents have been reported as having occurred when placing the plug of a connector into the socket. Electrical manufacturers should be grateful to the electrical inspector of factories for the hints he gives on the most suitable forms of design for various classes of apparatus. This year he gives good advice on how to deal with unprotected cables on motors and calls attention to some excellent methods of dealing with these in order to eliminate the danger which necessarily arises through the liability of the wires being trodden on, etc. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JUNE 18.—A hydraulic plant of some size has been erected not long since in the region of Verona, Italy, by one of the leading firms, the Canale Milani Company. The canal was built originally for irrigation purposes, but it possesses a fall of thirty-two feet. A considerable amount of power is secured by the present plant which is installed by the Westinghouse Company for the electrical outfit, while an Italian firm, Riva, Monneret and Company, supplied the turbines. The units in the plant are of 15,000-kilowatt size and are three-phase alternators working at 180 revolutions per minute, and supplying 3,300 volts. A bank of transformers raises the voltage to 40,000 for the pole line, the transformers being of the water-cooled oil type. Not far from the principal station has been erected a steam plant which serves as a standby to the former, and it contains Westinghouse alternator groups of 2,300 kilowatts. There is a second hydraulic plant in project which will work in parallel with the present one.

An experimental overhead structure for testing purposes has been erected by the Allgemeine firm of Berlin in order to find out the data as regards elevated electric roads. It is located at Oranienburg, and consists of a closed circuit formed by two straight portions 830 feet long, closed by two semicircular parts. Several kinds of overhead structure are used to form the circuit. Upon the elevated line there are made tests of an electric locomotive built by the firm, and the locomotive takes a train of 380 tons around the track, making over 500 rounds a day in general, and the tests are carried out for twenty hours. Current is secured over a power line from the Brandenburg station. The locomotive gives 1,050 horsepower, but this can be raised to 1,400 horsepower by adding a fourth motor. It is operated on 6,000 volts and 25 cycles.

At Bucharest, Roumania, there is a project on foot for building a new system of tramway lines. The Municipal Council will be represented for one-third in a syndicate which is to be formed for the purpose. The project includes a light and power plant which will be erected near the city. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, JUNE 26.—The civic power committee of Hamilton, Ont., has instructed the mayor of the city to apply to the hydro-electric commission for terms for 1,000 horsepower for civic purposes.

It is stated that the wireless telegraph apparatus, at the silver mines of Gowganda, Ont., is almost ready for business, and commercial messages will soon be sent over the tops of the forests to Elk City, Haileybury, and thence over the wire to the outside world. The connecting of Gowganda by wireless is one of the most fascinating features of silverland.

A large power development company on the Gatineau River, near Ottawa, is contemplating the erection of a transmission line to Brockville, Ont., taking in the intermediate points along the route. The company will be able to furnish the city of Brockville with 20,000 horsepower. The plant will have a capacity of 50,000 horsepower.

Fears that the Mexican Power Company might stop the dividend, in view of the break in the Mexican dam, have been dispelled for the time being, as it is announced that the regular one per cent quarterly payment has been declared on the common stock, payable on July 15.

The reorganization of the board of directors of the Quebec Railway means that steps will be taken for the consolidation of all the electric and power companies of the city of Quebec and district, and that important extensions will be made to the company's system, the intention being to continue the Quebec & Charlevoix road, which forms part of the system, to Murray Bay. The new company will, it is understood, be capitalized at $8,000,000.

In regard to cheaper cable service, Sir Sandford Fleming, of Ottawa, who is one of the greatest authorities on such matters, says that while he believes there will be no immediate result from the present agitation, there should be a cheaper rate between Canada and Great Britain. About one-fifth of the present rate, he declares, would be quite sufficient. Cable companies were laying new cables out of their revenues at the present time. In reply to a query, Sir Sandford said that he did not think that the Marconi system would ever take the place of the cable, although it will tend to decrease the cable rate. In a couple of years the rate between Canada and Great Britain, and all the colonies, will be much cheaper.

The following statement is appended to the May report of the Sao Paulo Company, Brazil: "The company has recently reduced its rates for electric light and power, and has also reduced the tramway rates by abolishing double fares on all lines on which two fares were charged, so that, at the present time, the entire system is operated under one fare. These changes in rates naturally affect the income slightly, but it is expected that very soon the effect of these reduced rates will materially increase it." W.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

NEW CALIFORNIA LIGHT AND POWER COMPANY INCORPORATED—Articles of incorporation have been filed for a $30,000,000 gas and electric company, designed to control all the gas and lighting plants in southern California. W. B. Cline, of the Los Angeles Gas and Electric Company, is president of the new concern.

POWER FOR NORTH CAROLINA TOWNS—The Burgrahaw Traction Company, capitalized at $3,100,000, which is connecting the three milling towns of Burlington, Graham and Haw River, N. C., with an interurban electric line, has begun work on a power plant on the Haw River. The development is capable of furnishing 20,000 horsepower, but the full capacity will not be sought in the first construction. The company will also furnish electricity for domestic and municipal lighting in the towns named.

PROPOSED PENNSYLVANIA TELEPHONE COMPANY—On July 7 application will be made at Harrisburg, Pa., for a charter for the National Telephone and Telegraph Company. Keystone Telephone Company interests will be strongly represented in the new company, which, at a cost of $1,000,000, will construct a long-distance telephone line from Philadelphia to the Ohio line. Similar companies will be organized in other states to carry the independent long-distance line west to St. Louis, where it will connect with the independent system of that city.

WESTCHESTER LIGHTING COMPANY—The New York Public Service Commission, Second District, has given its consent to the Westchester Lighting Company to purchase all the $804,000 capital stock of the Northern Westchester Lighting Company, and all the $500,000 common stock of the Peekskill Lighting and Railroad Company, for $505,000, and $75,000 of its six per cent cumulative preferred stock, at $75,000; also $90,000 of the first consolidated mortgage bonds of the Northern Westchester Lighting Company, at $81,000. The commission states that, in its opinion, the turning of the control of these companies over to the Westchester Lighting Company will result in superior facilities. The Westchester Lighting Company is authorized to issue $580,000 five per cent first collateral trust bonds, to mature in ten years from date. The proceeds are to be used for acquiring the stocks authorized to be transferred to it by the Northern Westchester Lighting Company and the Peekskill Lighting and Railroad Company.

LIGHTING AND POWER.

(Special Correspondence.)

MONETT, ARK.—The Monett Lumber Company will install an electric-light plant.

ROUND-UP, MONT.—James U. Gridley is seeking an electric-light plant franchise here.

CARTHAGE, S. D.—H. B. Potter has applied for a twenty-year franchise for an electric-light plant.

MINNEAPOLIS, MINN.—The Pike Electrical Company has increased its capital from $50,000 to $100,000. C.

EL PASO, TEX.—An addition is to be made to the power plant of the municipal electric-lighting plant.

TEMPLE, TEX.—The Temple Electric Light Company has been incorporated with a capital stock of $5,000.

CENTRAL CITY, NEB.—This city is to vote on the proposition to establish a municipal electric-light plant.

MONTPELIER, IND.—The B. W. Smith Company has incorporated to manufacture and deal in electrical supplies. S.

CALVERT, TEX.—The Calvert Water, Ice and Electric Light Company will erect an addition to its plant, to cost $40,000.

MOUND CITY, MO.—The Mound City Electric Light and Ice Company has been incorporated with a capital stock of $25,000.

QUINCY, ILL.—The Illinois Soldiers' and Sailors' Home of this city is in the market for a complete electric-lighting plant.

MILTON, ORE.—Bonds to the amount of $15,000 have been issued in this city for improving the municipal light and power plant.

SAN JOSE, CAL.—The board of supervisors of this county will on July 12 open bids for an electric conduit system applied for by the Los Gatos Ice, Gas & Electric Company of Los Gatos, Cal.

SAN FRANCISCO, CAL.—The Mountain Water Power Company has been incorporated here with a capital stock of $1,000,000 by J. T. Stanton, W. H. Barrows, J. C. Irvine, W. P. Barry and W. H. Phelps.

WINCHESTER, VA.—The Virginia Woolen Company has begun the construction of an addition reported recently. The company will install woolen machinery and electric motors of fifty horsepower at a cost of $8,000.

PORTALES, N. M.—Citizens of this town have been working assiduously to obtain a governmental power plant of $300,000 value, in or near Portales, the power from this to be conducted to individual pumps for general irrigation.

SAN FRANCISCO, CAL.—The directors of the Mojave Water and Power Company of San Francisco have called a stockholders' meeting for August 11 to take action on a proposition to create a bonded indebtedness of $15,000,000.

TACOMA, WASH.—It is reported here that C. A. Stone, of the Stone-Webster Company, is investigating the Lake Tapp region with a view to putting in a power plant near Sumner, Wash., with approximately 100,000 horsepower capacity.

NEVADA CITY, CAL.—Civil Engineer Edward C. Uren of this city and a corps of assistants are now in the field of the Middle Yuba River, below Graniteville, making the survey for the proposed electric plant to be installed by Dr. A. G. Wickell. U.

SANTA PAULA, CAL.—The Board of Trustees of this city has passed a resolution authorizing the president and secretary to sign a contract with the Ventura County Power Company for a new tungsten lighting system to be installed immediately.

TRENTON, N. J.—The Eastern Light and Fuel Company, of Camden, N. J., has been incorporated to generate electricity for light, heat and power; capital, $200,000. Incorporators: W. B. MacDonald, Camden; W. E. Stokes, B. L. Van Schaick, Philadelphia.

TOLEDO, OHIO—The electric lighting plant at West Liberty, Ohio, has been sold to Arthur Hartzler of Bellefontaine, who, it is said, will operate it under private ownership in the future. It is understood that the consideration paid was $10,000. H.

PROSSER, WASH.—Manager Harry Benson, of the Prosser Power Company, announces that a stone power house will be erected by the company at once at the Prosser Falls of the Yakima River. In this two units of 500 horsepower will be installed.

NEW YORK, N. Y.—Secretary of Commerce and Labor Nagel made an inspection trip recently to the immigration station of Ellis Island, when he discussed with the commissioner plans for the erection of a new $80,000 electric lighting plant at the station.

MASON CITY, IOWA—A scheme for harnessing the water-power of Lime River, at Portland, and the Shell Rock, at Nora Springs, to furnish power for the production of electricity in the operation of an interurban line between this city and Rockford, Ia., is being considered. Both local and foreign capital is interested.

LOS ANGELES, CAL.—The Los Angeles Aqueduct Commission has asked for an appropriation to cover preliminary expenses in the erection of hydroelectric power plants along the Owen's River Aqueduct now under construction. The expenses specified include the drawing of plans and the inspection of modern plants and machinery.

BANGOR, ME.—The Bridgewater Electric Company has been organized at Bridgewater, for the purpose of maintaining an electric-light plant in the town of Bridgewater, Me., with $10,000 capital stock. Officers: President, James H. Farley, of Bridgewater; treasurer, Judson C. Burt, of Bridgewater. Certificate filed June 4, 1909.

AINSWORTH, NEB.—The Ainsworth Light and Power Company has just been formed. It is already at work on the installation of a plant for furnishing light and power. A dam is to be built at Plum Creek, fourteen miles from town, and something over 400 horsepower will be developed. The capital stock of the company is $60,000.

OAKLAND, CAL.—The Oakland Light & Power Company, recently incorporated here with a capital stock of $1,250,000, began work on June 14 on its power plant at the corner of First and Alice streets. The new plant is to be equipped with machinery to develop 25,000 horsepower and is planned to be ready by January 1, 1910.

MONTPELIER, VT.—The Vermont Lighting and Power Company is erecting a 500-horsepower Corliss engine at the Viles plant, which will be connected with a 350-kilowatt Westinghouse generator. During the low water last year, the company was 400 horsepower short in furnishing power, and this auxiliary will care for the additional load.

DENVER, COLO.—A syndicate composed of the holders of the $900,000 worth of bonds of the Lacombe Electric Company, headed by Emerson McMillan, who resigned as chairman of the board of the Denver Gas and Electric Company a short time ago, is being organized to look after the interests of the holders of these bonds. A protective committee has been formed and is now seeking to get in touch with these security holders. Emerson McMillan is apparently entirely out of the Denver company and it is claimed that he has sold all of his holdings. It was

denied, however, that there had been any break between the Doherty and the McMillan interests and that his retirement was because he could not be with both companies in the fight which may develop over the Lacombe bonds.

WALLA WALLA, WASH.—Plans for a new $100,000 power plant and substation, and for a $30,000 office building and depot, were announced to-day by officers of the Northwest Corporation, the holding company for the local electric company, and the Walla Walla Valley Traction Company. Work on these buildings is to commence immediately.

GREENVILLE, S. C.—Arrangements are being made, it is understood, by the management of the Monaghan Mills, for the driving of the plant by electricity, although the change will not be made for some time. The large Cooper-Corliss cross-compound engine now in operation at the plant will be used for emergencies after the installation of electricity.

DENTON, MD.—The managers of the new electric-light plant here, Henry C. Hawkins, formerly with the Consolidated Gas and Electric Company, of Baltimore, is now wiring dwelling and business places in town and installing street lights. Electricity will take the place of acetylene gas in Denton streets and the thoroughfares will be lighted all night every night in the year.

LITTLE ROCK, ARK.—The Garland Power and Development Company, with offices at Hot Springs, has filed articles of incorporation with the secretary of state. The capital stock is $1,500,000. The company has been formed for the purpose of building a dam across the Ouichita River in order to generate waterpower to be supplied to Pulaski, Saline, Garland and Hot Springs counties.

SAVANNAH, GA.—The increased demands for a greater output by the Savannah Electric Company, of this city, in the lighting line has forced the company to arrange for doubling the capacity of its present plant. A new turbine from the Allis-Chalmers Company has been ordered, while other new machinery will be installed, beginning July 1. Many extensions have already been made this year.

FULTON, N. Y.—The Oswego County Light and Power Company has been authorized by the Second District Public Service Commission to increase its capital from $100,000 to $1,000,000 and to issue a mortgage on its properties not exceeding $4,000,000, to secure a bond issue of that amount. The company will develop Salmon River Falls, near Pulaski, and furnish electricity for Syracuse and other points.

MINNEAPOLIS, MINN.—Commencing July 1, the Minneapolis General Electric Company announces reductions in its rates of seventeen per cent on residence lighting; ten to seventeen per cent on commercial lighting and fifty per cent on minimum power rates, to those of its customers who are not in arrears. The company makes the reductions in order to induce the Council to repeal the ordinances of 1907, which declared the five franchises of the company void, and also to induce those customers who have refused to pay their bills in the last two years, except at the rates fixed by the 1907 ordinances and which rates the company declines to accept, to pay up. C.

BIRMINGHAM, ALA.—The Chattanooga and Tennessee River Power Company, the corporation that is building the 50,000-horsepower electric plant at Hale's Bar, where the great lock and dam is being erected under the auspices of the United States government, has filed an application for an increase of its capital, by charter amendment, from $3,500,000 to $5,000,000. Because of the need of more capital to complete the plans of the company this action was determined on at a meeting of the stockholders and directors a month ago. The board of directors signed the application for amendment. They are R. H. Williams, James C. Brady, A. E. Brady, C. E. James and George D. Lancaster.

INDIANAPOLIS, IND.—A score or more of locomotive engineers gave the Indiana Railroad Commission their unqualified indorsement of the twenty-candlepower oil lamp now in use, and condemned strongly the use of electric headlights on locomotives, at the second conference held before the Commission, June 11. The engineers who had had experience with high-power locomotive headlights stated that the intense rays of light blinded them to an extent that they were unable to read signals either approaching or riding behind the electric lights; that their use endangered the lives of employes and of the traveling public. Tests will be made by the Commission and another conference held June 29. S.

LEWISTON, ME.—The Union Water Power Company has secured control of the waterpower privileges of the International Paper Company on the Androscoggin River for a distance of six miles, between what is known as the Babbitt and Googin dam and the Turner Center bridge. Between these two points, which are from five to eleven miles above this city, there is a fall of forty-four feet and it is capable of developing over 10,000 horsepower. The company will build a concrete dam and an electrical power station and will transmit the power to Lewiston for the mills, which are largely increasing their capacity, and for another new mill to be built here. This development will about double the available power for the cotton mills of this city.

PHILADELPHIA, PA.—The properties and franchises of the Philadelphia, Bristol & Trenton Street Railway Company, a subsidiary of the Interstate Railways Company, will be sold at public sale within the next thirty days, the upset price being $200,000 under a decree of foreclosure entered by Judge Stout at Doylestown, Pa. The property has not earned the interest on its $650,000 first-mortgage five per cent bonds for years, and the Interstate management decided last fall that this property was a drag on the holding company, so defaulted the interest due September 1, 1908, on the bonds. It has outstanding $1,000,000 stock, a majority of which is owned by the United Power and Transportation Company.

DENVER, COLO.—Negotiations conducted for several months are understood to have culminated in a contract with the Colorado Central Power Company to furnish for the famous Georgetown loop of the Colorado & Southern. It is the initial undertaking for the electrification of steam roads in Colorado, and is to be followed, it is stated, with arrangements for converting other lines of the Colorado & Southern into electric roads. The Georgetown loop has for years been a popular one-day excursion ride out of Denver. Its sharp curves and stiff grades have made operation difficult, and yet gained fame for the line. It is one of the few narrow-gauge roads still upon the railroad map over which many specials are run.

BOISE, IDAHO—L. W. Glass, who is in charge as superintendent of the Shoshone Falls power plant and also of all electrical installation and operation for the Kuhns, who recently spent a short time in Boise, is authority for the statement that an additional unit of 1,800 horsepower is to be installed at the falls. The present production is 850 horsepower. Ground is now being cleared and a camp established at Little Salmon Falls, where a plant is to be established by the Kuhns to generate 30,000 horsepower. This power will be used in the construction work on dams and canals for the various undertakings of the Pittsburg men on the Carey tract segregations and will be sold at the various towns on the tract.

DOTHAN, ALA.—D. G. Zeigler & Company, of Jacksonville, Columbia, S. C., and Atlanta, propose to develop 4,300 horsepower at the Abbey Creek in Henry County, twenty-two miles from here, and furnish power for Dothan, Headland, Abbeville, Eufaula and all other towns within a radius of sixty miles. They have secured the site for their power plant, and if the right kind of a deal is made with the city, they are prepared to go to work immediately. The firm of D. G. Zeigler & Co. now have fourteen different contracts of this kind under way, and are big contractors in this line of work. The present jobs represent the expenditure of something like $20,000,000, scattered over South Carolina, Georgia, Florida and Alabama.

BIRMINGHAM, ALA.—Two new power and mill concerns are to operate in this state. The Abbeville Power and Manufacturing Company, of Abbeville, has been incorporated with a capitalization of $500,000. Its purpose is the development of a waterpower plant with electrical transmission for a cotton mill which is to be established. J. L. Pollard and C. J. Owens are the principal promoters. The other enterprise will be incorporated as the Geneva Power and Manufacturing Company, also with a $500,000 capitalization. It will be a hydroelectric plant to operate a cotton mill planned by the concern and to furnish power to others. D. O. Vaughan, D. G. McInnis, D. H. Morris and A. M. McKinnon are the projectors.

SPOKANE, WASH.—The Northern Idaho and Montana Power Company, which recently took over the electric light and power plants and sites at Sandpoint and on Moyle River, formerly controlled by J. L. Drumheller of Spokane, has purchased the entire plant and business, including local telephone and water service, from the Kalispell Water and Electric Company at Kalispell, Mont., on which they have held an option for sixty days. The purchasing company is a big concern with capital stock of $10,000,000 and does business in several states. It recently purchased the Big Fork power plant of the Flathead Valley Water Power Company and the deal just consummated places that plant and the local light and telephone plant under one management.

CHARLOTTE, N. C.—Dr. W. G. Wylie, of New York, president of the Southern Power Company, of Charlotte, the largest electro-hydraulic development company in the South, states that according to the estimates of engineers the new development of the Wateree River, near Camden, S. C., will furnish 100,000 horsepower, much more than had been expected by the first estimate. The preliminary surveys are being completed and the actual structural work will begin as soon as possible. When the Wateree development is completed the Southern Power Company will establish an office at Columbia for the South Carolina district, which will have at its disposal more than 100,000 horsepower, the office at Charlotte then to control a somewhat smaller amount.

ELECTRIC RAILWAYS.

(Special Correspondence.)

NIAGARA FALLS, ONT.—The Niagara, St. Catharines & Toronto Railway has at last completed negotiations whereby the line will be extended from Welland to Port Colborne, eight miles. This will put the latter port, which is on Lake Erie, in direct trolley communication with this city. The work will be completed by August. The company last year extended the line from Thorold to Welland, but no further work was done and since then arrangements have been under way whereby the shore of Lake Erie might be tapped via Port Colborne.

MILLVILLE, N. J.—Capitalists are considering plans to build an electric railroad by a short route to Port Norris. The survey has been made and the work will start at once. The route will be from Millville due south to Haleyville, where it will connect with the West Jersey & Seashore Railroad direct to Port Norris and Bivalve. The line will carry both passengers and freight, and will be several miles the shortest possible route between the great oyster centers and Camden. To complete this work it will be necessary to lay less than seven miles of track.

GOSHEN, N. Y.—Although the Rockland Railroad Company's lines of electric railway exist only on paper as yet, the company is desirous of extending its proposed system from these six miles originally contemplated, and has applied to the Public Service Commission for permission to make extensions from Sparkill to State Line, Nyack, New City, Congers, West Haverstraw, Haverstraw, Stony Point, Suffern, Nanuet and Pearl River. The increased mileage by reason of these additions to the road would be thirty-four miles and the estimated total cost $2,982,000.

OLYMPIA, WASH.—Walter Christian, of Tacoma, attorney for the Harriman roads, has filed with the secretary of state articles of incorporation of the Peola & Snake River Railroad & Navigation Company, with $400,000 capital, headquarters at Tacoma, and Ed. M. Lakin, W. H. Carey and J. F. Murphy, of Tacoma, as incorporators. The announced purposes are to build and operate a railroad from the junction of Dead Man's Hollow and the Snake River, in Garfield County, thence easterly along the valley to its head, and thence southerly to Peola, Garfield County.

WORCESTER, MASS.—Agreements have been executed whereby the Worcester & Blackstone Valley Street Railway Company purchases the franchise and property of the Uxbridge & Blackstone Valley Street Railway Company. The Worcester & Southbridge Street Railway Company agrees to purchase the Hartford & Worcester Street Railway Company. These consolidations of four lines under two heads which are closely related are subject to approval by the Railroad Commission. The merger would connect the pieces of two continuous lines south and southeast from Worcester.

RUSHVILLE, IND.—Rushville is to have another traction line. The project is being pushed by a New York bonding house and has been considered by them for over three years. It has planned to run the tracks with a northern terminus at Shirley, parallel with the Big Four Railroad to Knightstown, thence in a southeastern direction, and take in the Soldiers' and Sailors' Orphans' Home, and back southwest to Carthage. Then it will be run alongside the Big Four to this city, Rushville being the southern terminus for a time, until an extension is made on south to Andersonville and Brookville.

CLAREMORE, OKLA.—The mayor ordered all business houses to close one day last week until a bonus of $25,000 was raised for the Cherokee Belt and Interurban Railroad, and as a result the bonus was practically raised in a few hours. This is a proposed road extending from Pryor Creek on the M., K. & T. Railroad on the east to the town of Skiatook on the Midland Valley Railroad on the west, being about forty-three miles in length and connecting five trunk line railroads—the M., K. & T. at Pryor Creek, the Missouri Pacific and Frisco at this place, the Santa Fe at Collinsville and Midland Valley at Skiatook.

VANCOUVER, B. C.—An enterprise originated by local capitalists who have secured the financial support of the Earl of Aberdeen, viceroy of Ireland, and owner of the famous Coldstream ranch near Vernon, is to be started shortly. It is the construction of 100 miles of electric railway, tapping the principal fruit-growing centers on both sides of the Okanaqan Lake. The new company was incorporated by special act at the last session of the provincial Legislature. The proposed line is expected to greatly aid the rapid collection of fruit at Vernon, where it is intended to make a large fruit exchange.

ALBANY, N. Y.—The Public Service Commission has authorized the Rockland Railroad Company to construct and operate its line in Rockland County and to exercise franchises in the villages of Piermont, Grand-View-on-Hudson, Nyack, South Nyack, Haverstraw, West Haverstraw, Spring Valley and Suffern, and in the towns of Clarkstown, Stony Point, Orangetown and Ramapo. A franchise has also been received from the County Board of Supervisors. The permission given will enable the company to construct trolley lines throughout the greater part of Rockland County. There are no trolley lines in that county at present.

BELLINGHAM, WASH.—It is stated here that the Canadian Pacific Railway plans to build a line from its main road in British Columbia, over the Cascade Mountains, down the Skagit Valley to Anacortes and ultimately to Seattle. The big power plant being built by the Skagit Power and Development Company on the Skagit River, the proposed line of the Anacortes, Sedro-Woolley & Eastern and the line of the Puget Sound & Baker River Railway, which will be converted into an electric road, are all properties of the Canadian Pacific.

ALLENTOWN, PA.—At a special meeting the stockholders of the Lehigh Valley Transit Company have voted to spend practically $1,000,000 for improvements to the system, largely for a belt line in Allentown. The increase of indebtedness was from $7,600,000 to $9,000,000. Favorable action was taken on the proposition, and President R. P. Stevens will now be in a position to bring the Transit system to a higher state of efficiency than ever before. About $500,000 will go to pay outstanding notes, while the rest is to be expended in improvements, including the Allentown extensions, track repairs, higher power and new rolling stock.

SEATTLE, WASH.—Stockholders and bondholders of the Alaska Central Railway Company, represented by the Bellaire and Frost factions, have settled their differences. R. D. Miller of Spokane, has been elected president, with other officers and directors as follows: Vice-president, G. R. Sanborn; secretary-treasurer, James H. Haight; directors, former United States Senator George Turner, R. E. W. Strickland, L. Roy Slater and G. W. Dickenson. The new officers will endeavor to pay a bonded indebtedness of $3,000,000 and repair the line, extending it twenty miles to Turnagain Arm. The line is completed from Seward to mile fifty-six.

TAUNTON, MASS.—The railroad commission is considering the advisability of authorizing the issue of new bonds for extensions and improvements by the Boston & Northern and the Old Colony Street Railway companies, both roads having submitted statements as to their plans. The Old Colony would issue $275,000 in bonds, to be spent for new equipment, duplicate transmission line between Brockton and Fall River, underground conduits for feed wires in Brockton, a telephone line between Taunton and Fall River, and a new power station and paint shop in Fall River. The Boston & Northern wants to issue bonds to the value of $536,000.

HARTFORD, CONN.—The Legislature has taken action on several trolley charter propositions. In the House the charter of the Danbury & Bethel Street Railway Company was amended in regard to extensions desired by the company, and the New London & East Lyme Street Railway Company's charter was amended so as to permit this company to build westerly from Niantic through East Lyme and Old Lyme to the Connecticut River. In the Senate the charter of the Meriden, Middletown & Guilford Company, which has not yet built, was extended for two years, from July 1, instead of to November 1, 1910, as has been the rule of the joint committee on railroads this session.

JERSEY CITY, N. J.—The Public Service Corporation of New Jersey has purchased the Apgar homestead in Jersey City. It is generally believed that the land, for which the Public Service Corporation paid $31,000, will be used for the purpose of erecting a depot near the station that will be constructed in Hudson City when the Hudson & Manhattan Railroad Company has completed the tunnel from the Pennsylvania Railroad depot at Newark. The Pennsylvania Railroad has authorized the tunnel company to construct a tunnel underneath its tracks through Railroad avenue to Summit avenue, from which point the electric trains when in operation will use the present tracks to the new Harrison terminal.

WATERTOWN, WIS.—The new electric line of the Milwaukee & Western Electric Railway Company between Milwaukee and Beaver Dam now seems an assured fact. The construction of the line will begin this fall. This was announced at the annual meeting of the stockholders, held recently in Milwaukee. The contract for the work was awarded to the Chapman Construction Company, of Chicago. Officers have been elected as follows: Valentine Zimmermann, Milwaukee, president; Alvin P. Kletsch, Milwaukee, first vice-president; Richard Roll, Hustisford, second vice-president; J. W. Barber, Milwaukee, secretary; W. E. Elliot, Milwaukee, general manager, and H. L. Janzer, Milwaukee, treasurer.

TACOMA, WASH.—The $5,000,000 mortgage given by the Pacific Traction Company, recently filed, means the beginning of work on the part of a street-car line to carry out plans outlined several years ago, when the company obtained franchises here. The first work will be double-tracking of the present line to the baseball park. This will be followed by other lines over streets where the company has franchises. It is the announced purpose to get down on Pacific Avenue and out that way to South Tacoma, making two lines of its own to the south end of the city. Other lines will go to Point Defiance and Bismarck. The Pacific Traction Company will also build an interurban line from South Tacoma to Olympia and Grays Harbor.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

MILFORD, IOWA—The Midland Telephone Company has increased its capital stock to $50,000. C.

LA WARD, TEX.—The Bay Telephone Company has been incorporated with a capital of $1,200.

CORNING, IOWA—The Middle Valley Mutual Telephone Company will rebuild its entire line.

GRINNELL, IOWA—The Interior Telephone Company will expend $20,000 to $30,000 in improvements.

MARFA, TEX.—The Marfa Power Company has been succeeded by the Marfa Telephone Company.

FLORENCE, OKLA.—The Boone Telephone Company has been incorporated by C. E. McIntosh and others.

TERRY, MONT.—The Co-operative Telephone Company has been organized, with a capital stock of $40,000.

COLUMBUS, OHIO—The Flushing Telephone Company has increased its capital stock from $50,000 to $75,000.

WAVERLY, S. D.—The Waverly Farmers' Telephone Company has been incorporated with a capital stock of $25,000.

BRITT, IOWA—The Hancock County Telephone Company will purchase the Western Electric Line and will extend it to Crystal Lake.

BAKERSFIELD, CAL.—The Kern Mutual Telephone Company has been awarded a franchise along certain public highways in this county.

ELY, NEV.—At a meeting of the directors of the White Pine Telephone Company last week it was decided to reconstruct the line from Ely to the mines.

NEW BEDFORD, MASS.—At a recent meeting of the directors of the Automatic Telephone Company, in this city, it was voted to increase the dividend on the common stock to seven per cent.

COLUMBUS, GA.—The City Council has approved the purchase of the local Automatic Telephone Company by the Southern Bell Telephone Company, and the consequent merger of the two systems.

OROVILLE, CAL.—The Pacific States Telephone Company has announced plans for expending $10,500 on its telephone system in this city. A new long-distance line will be also built between Marysville and this city.

HARRISBURG, PA.—A charter has been issued here for the West Shore Telephone Company to run lines from Lemoyne, Cumberland County, to Camp Hill and Carlisle, New Cumberland and York, Enola and New Bloomfield and this city.

TOPEKA, KAN.—The Independent Telephone Company announces the completion of its copper toll lines to Wichita, Hutchinson, Newton, Kingman and territory. The service to these cities will be the very best and gives connections with thousands of telephones not reached heretofore.

SAN FRANCISCO, CAL.—Under the direction of Master Electrician George Hanscom, the Navy Department this week began the reconstruction of the wireless plant on the Farallon Islands. A number of new instruments will be installed, increasing greatly the efficiency of the plant.

FORT WAYNE, IND.—The Citizens' Home Telephone Company has entered upon the work of constructing a new circuit toll line connecting a number of independent systems in Indiana and Ohio. When completed the toll-line service will be accessible to a large number of telephone patrons. S.

OAKLAND, CAL.—The Home Telephone Company announces that six miles of cable, weighing 600,000 pounds and costing $30,000, to be used in connecting Oakland with San Francisco, has been turned over to the telephone company by the Oakland manufacturers. Preparations are now being made for laying the cable.

BEATRICE, NEB.—The Lincoln Telegraph and Telephone Company will expend $50,000 within the next sixty days in improving and extending the lines of the New Home Telephone Company, which it recently purchased. A preliminary survey of the proposed improvements has been made in southern Gage County.

HARRISBURG, ILL.—Chas. V. Parker, secretary and treasurer of the Saline County Telephone Company, has returned from Murphysboro, where, at a meeting of the officials of the several principal telephone companies operating throughout the large territory extending from Harrisburg south, and practically trunking the cities and towns of the down-state, a merger was completed last week. The Murphysboro Telephone Company acquires the management and control of the whole. By vote of the stockholders the capital stock of the home company was increased from $10,000 to $50,000, in order that the merger could be perfected. The companies that figure in the merger are Carterville Herrin Telephone Company, Saline County Telephone Company, Ava and Southern Illinois Telephone Company and Johnston City Telephone Company.

DALLAS, TEX.—Formal statement has been made that the Independent Telephone Company of Dallas has let the contract for a new system capable of accommodating 35,000 subscribers, and that the cost is to be $1,200,000. A site for the exchange has been purchased and conduits have been laid on the principal streets.

INDIANAPOLIS, IND.—The Indiana State Tax Board has decreased the value of the Central Union Telephone Company's property in the state $600,000 and increased the value of the Indianapolis Telephone Company and the New Long-Distance Telephone Companies in the aggregate $120,000. The decrease is due to the surrender of a number of fields to the independents. S.

FRANKFORT, KY.—The Home Telephone Company has purchased a franchise from the city to conduct a telephone exchange in this city in conformity with the ordinance recently passed by the Council regulating telephones and fixing the maximum price at $2.50 for business houses and $1.50 for residences. The franchise was purchased by Attorney Guy Bridge for the Home Company.

INDIANAPOLIS, IND.—The New Long-Distance Telephone Company is installing an additional toll circuit on its poles between this city and Terre Haute. When completed Terre Haute will have superior toll-line facilities with Indianapolis and the Eastern points. This company connects with the Citizens' Telephone Company of Terre Haute, which is connected with a score of rural lines in Vigo and adjoining counties whose patrons enjoy the toll-line service which this outlet affords. S.

BREMERTON, WASH.—The Pacific Telephone Company is about to lay a new submarine telephone cable between Alki Point and Restoration Point, connecting Seattle with Bremerton and other points on the west side of Puget Sound. The old cable across the sound has been damaged. Two reels, each containing 8,250 feet of ten-pair steel-armored submarine cable, are to be used. Each reel weighs sixteen tons and is fifteen feet in width and ten feet in height.

TOLEDO, OHIO—The Toledo Home Telephone Company is about to construct its first branch exchange on the west side at a cost of $40,000, work to begin in the near future. It will be equipped with an automatic switchboard with a capacity of 1,000 telephones, and will be the first automatic switchboard in this territory. In addition to deciding on this the directors at their meeting held this week declared the usual quarterly dividend of 1½ per cent, payable to stockholders of record on July 20. The company reports 600 additional subscribers during the months of May and June. H.

BRAZIL, IND.—A deal that has been on for some time has been closed by which the Citizens' Telephone Company, of this city, has purchased the property of the Central Union Telephone Company for the sum of $52,000. For a time both lines will be operated independently, but as soon as it is possible to make the change both lines will be merged into one exchange, which means that the large number of citizens now having both phones can have their Bell phone taken out. The purchase includes all of the telephones of the county, but the Central Union retains its long-distance service and wires.

OKLAHOMA CITY, OKLA.—Unable to handle the outside telephone business of Oklahoma City with only one system over the main line of the M., K. & T. Railroad, which does not pass through this city, H. C. Wilson, of New Yrok, general superintendent of the American Telephone and Telegraph Company, has completed negotiations for construction of another circuit over the Santa Fe line from Dennison or Gainesville, Tex., to Newton, Kan., via Oklahoma City. The coming of the packing plant to the city had much to do with the final decision, which means the expenditure of nearly a half million dollars in the state of Oklahoma alone.

PITTSBURG, PA.—Pennsylvania, West Virginia and New England capital is behind the National Telephone Corporation, of Pittsburg, chartered in Charleston, W. Va., capitalization $15,000,000, which will work in harmony with a similar syndicate in the West, headed by St. Louis men, in pushing a network of long-distance independent telephone lines across the Continent. The new corporation is designed to handle the entire long-distance service of the independent lines east of Chicago. West of Chicago the toll lines will connect with those of the western syndicate, which has control of the extreme northern field, including Michigan and Wisconsin. At the head of the new company chartered at Charleston is John A. Howard, of Wheeling, who was elected president of the Pittsburg and Allegheny Telephone Company at the reorganization this week.

ELECTRICAL SECURITIES.

For some time past trading on the stock exchange has been confined mainly to professionals, but strength has again been shown, even with perfunctory transactions. United States Steel has been leading the industrials in a slight advance, which has been partly shared by railway stocks. Steel common is now at about its record price. Expenditures by railways and industrial corporations alike are encouraging. If the public was in the market there would probably be a big rally.

Dividends have been declared upon the following electrical securities:

Bell Telephone Company of Missouri; the regular quarterly dividend of two per cent, payable July 1.

Boston Suburban Electric Company; regular quarterly dividend of seventy-five cents on the preferred stock, payable July 15 to stock of record June 30.

Central District and Printing Telegraph Company; a regular quarterly dividend of two per cent, payable July 31 to stock of record June 24.

Central and South American Telegraph Company; the regular quarterly dividend of one-and-one-half per cent, payable July 9 to stock of record June 30.

Consolidated Traction Company of New Jersey; a regular semiannual dividend of two per cent, payable July 15 as registered on June 30.

Knoxville Railway and Light Company; a regular quarterly dividend of one-and-one-half per cent upon the preferred stock, payable June 30; books closed June 22, 1909; also the regular quarterly dividend of one per cent on the common stock, payable June 30, 1909; books closed June 22. In addition the company has declared a special dividend of one per cent on the common stock, payable June 30; books closed June 22.

Little Rock Railway and Lighting Company; the regular semiannual dividend of two-and-one-half per cent, an extra dividend of one-and-one-half per cent on the common stock and the regular semiannual dividend of three per cent on the preferred stock, both payable June 30.

Massachusetts Lighting Companies; the regular quarterly dividend of one-and-one-half per cent and one-fourth of one per cent extra, the same as six months ago, payable July 15.

Mexican Telegraph Company; the regular quarterly dividend of two-and-one-half per cent, payable July 15 to stock of record June 30.

New York & New Jersey Telephone Company; the regular quarterly dividend of one-and-three-fourths per cent, payable July 15 to stock of record July 6.

Seattle Electric Company; a dividend of $3 per share on the common stock, payable July 15 to stock of record July 6.

United Railways Company of St. Louis; a regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable July 10.

NEW YORK.	June 28.	June 21.
Allis-Chalmers common	14¼	15¼
Allis-Chalmers preferred	51¼	51⅞
Amalgamated Copper	81⅜	78⅜
American Tel. & Cable	80*	80*
American Tel. & Tel	141⅝	140⅛
Brooklyn Rapid Transit	79½	77¼
General Electric	161	160
Interborough-Metropolitan common	17¼	15⅜
Interborough-Metropolitan preferred	51⅜	44⅛
Kings County Electric	130	129
Mackay Companies (Postal Telegraph and Cables) common	80	79½
Mackay Companies (Postal Telegraph and Cables) preferred	73⅞	74
Manhattan Elevated	142½	143
Metropolitan Street Railway	23	27
New York & New Jersey Telephone	133	129
U. S. Steel common	66⅜	64¼
U. S. Steel preferred	123⅜	121
Western Union	72	72⅝
Westinghouse common	85	83
Westinghouse preferred	123*	122*

*Last price quoted.

BOSTON.	June 28.	June 21.
American Tel. & Tel	141⅝	140¾
Edison Elec. Illuminating	248	249
General Electric	161	160
Massachusetts Electric common	12	12
Massachusetts Electric preferred	68½	67½
New England Telephone	132	132
Western Tel. & Tel. common	9¾	10
Western Tel. & Tel. preferred	86	87

PHILADELPHIA.	June 28.	June 21
American Railways	45¾	45¾
Electric Company of America	12⅜	12⅜
Electric Storage Battery common	52½	53½
Electric Storage Battery preferred	52½	53½
Philadelphia Electric	11⅞	11¾
Philadelphia Rapid Transit	28¼	28⅜
Philadelphia Traction	91	91
Union Traction	52	52

CHICAGO.	June 28.	June 21
Chicago Railways, Series 2	37½	36½
Chicago Subway	24	24¼
Chicago Telephone	134	132½
Commonwealth Edison	120	118
Metropolitan Elevated common	17½	19
Metropolitan Elevated preferred	50	54
National Carbon common	92	93
National Carbon preferred	117	118

NEW PUBLICATIONS.

UNIVERSITY OF ILLINOIS BULLETIN—The University of Illinois Engineering Experiment Station has issued Bulletin No. 30, which deals with the rate of formation of carbon monoxide in gas producers, and which was prepared by J. K. Clement with the assistance of L. H. Adams. The mathematical appendix was added by Prof. C. N. Haskins.

REPORT OF THE COMMISSIONER OF EDUCATION, 1908—The second volume of the annual report of the Commissioner of Education has been published by the Government Printing Office, Washington, D. C. This report is for the year ended June 30, 1908. Among interesting topics on which the second volume treats, aside from complete statistics of common and secondary schools, are reports on the work conducted by the various universities, colleges, technological and professional schools throughout the country. Among other chapters are some devoted to manual and industrial training, commercial and business schools.

PERSONAL MENTION.

WILLIAM BARCLAY PARSONS returned from Europe last week on the Kaiser Wilhelm II.

LOUIS A. LURRENNE, traffic manager of the French Cable Company, left on the La Lorraine last week for a three months' vacation in Europe.

GEORGE WESTINGHOUSE, president of the Westinghouse Electric and Manufacturing Company, has been in Pittsburg the last week making an inspection of the properties.

WILLIAM M. SMITH, formerly treasurer of the Chicago Insulated Wire and Manufacturing Company, has resigned his position with that concern to become associated with the American Insulated Wire and Cable Company, also of Chicago, Ill.

THEODORE N. VAIL, president of the American Telephone and Telegraph Company, who has returned from a trip West and Southwest, says: "There certainly is no cause for any business depression. As it looks to me the confidence necessary to a very prosperous era is rapidly returning."

ARTHUR N. DUTTON has resigned as superintendent of transportation of the Brooklyn Rapid Transit Company to become the vice-president and general manager of the Peerless Motor Car Company of New York. Mr. Dutton had no street railway experience when he entered the employ of the Brooklyn Rapid Transit Company six years ago. He is a native of Milwaukee, and only thirty-six years old.

BENJAMIN WALL has taken a position with Betts & Betts, Incorporated, electrical advertisers, New York city, as manager of the central-station department. The new position will keep Mr. Wall in close touch with the interests with which he has been long identified. Mr. Wall has recently been associated with the New York Edison Company, and before that with the Metropolitan Engineering Company, Brooklyn, N. Y.

W. A. REICHERT, for the past three years advertising manager for the Fort Wayne Electric Works, Fort Wayne, Ind., has resigned to accept a similar position with the Power and Illuminating Engineering Company, of Alliance, Ohio. This company is a commercial organization co-operating with central stations to increase the day load on their plants. Mr. Reichert's ability in this line is well known and with his aid the day-load boosters will undoubtedly achieve much deserving success.

HERBERT ALDEN SEYMOUR, editor of the *Electric City Magazine*, a publication which has labored more earnestly and successfully than any other in the single purpose of drawing the attention of the electrical world and the general public to the advantages of central-station power from its particular point of view, is to be congratulated on the snappy and appropriate—beautiful, too—front cover page for the July issue of his journal. Mr. Seymour has conducted the *Electric City Magazine* for six years—ever since it started—and makes it brighter every month. "Ad astera" is clearly his motto, and he not only reaches to them but gives them brilliancy by bringing them nearer to earth.

OBITUARY.

W. W. DUDLEY, former president of the National Fire Protection Association, died on June 9, last, at Chicago. The National Fire Protection Association has distributed an "In Memoriam" card announcing this to its members and others interested.

C. C. REYNOLDS, general manager of the Terre Haute, Indianapolis & Eastern Traction Company, died on June 26 at his home in Indianapolis, death following a stroke of paralysis. Mr. Reynolds was at one time superintendent of the Chicago & Erie division of the Erie Railroad.

ALBERT P. WATSON, who drove the first bolt in the ironclad Monitor, and for some years was on the editorial staff of the *Scientific American*, died on June 22 at his home in Elizabeth, N J. Mr. Watson founded the *Mechanical Engineer* in 1881, and continued its publication for sixteen years. He was

for many years a member of the Marine Engineers' and Naval Architects' Association, and was a vice-president of the National Association of Marine Engineers.

SARAH J. SARGENT, the elderly sister of W. D. Sargent, vice-president of the New York & New Jersey Telephone Company, died on Saturday, June 26, at Mr. Sargent's home in Brooklyn, N. Y. The funeral services were held at 820 Union Street, Brooklyn, on the afternoon of June 29, and interment after cremation was made at Greensburg, Pa.

WALTER SCOTT HUGHES, a captain in the United States Navy, who retired from the service in July, 1905, died recently at Santa Cruz, Cal. He was fifty-seven years old. He was born in Marshalltown, Iowa, and was graduated from Annapolis in 1875. Captain Hughes wrote extensively about technical naval affairs, his most familiar work being "Electricity and Warfare."

PATRICK H. DOLAN, superintendent and a director of the Pittsfield (Mass.) Street Railway Company, died on June 25, at his home after a brief illness. With his brother, Peter C. Dolan, he owned a controlling interest in the company. The brothers, before they went to Pittsfield fifty years ago, controlled the street-railway system in New Britain, Conn. Mr. Dolan was fifty-one years of age and a native of Ireland.

ORRIN S. WOOD, one of the first builders of telegraph lines in this country, died on June 22, at his home in Turner, N. Y. He was ninety-one years old. Mr. Wood was born in Sherburne, N. Y., and became a telegraph operator in Washington in 1844. He studied telegraphy under S. F. B. Morse, and in 1845 superintended the construction of the first telegraph line between New York and Philadelphia. He opened the first telegraph office in New York city, and in the following year built a line between Albany and Buffalo. Later he became superintendent of the Montreal Telegraph Company until 1866, when he reconstructed the telegraph system northwest of Chicago. On its completion the system was sold to Jay Gould and became included in the Western Union lines. Mr. Wood retired from active business thirty-five years ago.

PROPOSALS.

ELECTRICAL SUPPLIES, BROOKLYN NAVY YARD—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids until July 13 for the supply at the Brooklyn Navy Yard of 5,000 feet of lamp cord, 9,000 feet of duplex rubber-covered wire, and miscellaneous electrical supplies. Applications should be made to the Bureau for Schedule No. 1395.

POST OFFICE, BELLEVILLE, ILL.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., July 29, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Belleville, Ill., in accordance with drawings and specifications, copies of which may be had from the custodian of site at Belleville, Ill., or at the Supervising Architect's office.

POST OFFICE, HUDSON, N. Y.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., July 28, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Hudson, N. Y., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Hudson, N. Y., or at the Supervising Architect's office.

POST OFFICE AND COURT HOUSE, COUNCIL BLUFFS, IOWA—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., August 3, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension to the United States Post Office and Court House at Council Bluffs, Iowa, in accordance with drawings and specification, copies of which may be obtained from the custodian at Council Bluffs, Iowa, or at the Supervising Architect's office.

INDUSTRIAL ITEMS.

THE TRIUMPH ELECTRIC COMPANY, Cincinnati, Ohio, has issued Bulletin 361, containing an illustrated article, entitled "Induction Motors in a Piano Factory," reprinted from the *Electrical Record*, December, 1908. The applications of the induction motors herein described are both typical and suggestive.

THE TUNGSTOLIER COMPANY, Cleveland, Ohio, is distributing a souvenir booklet, entitled "The Luminaries," which was specially prepared for the recent Atlantic City convention of the National Electric Light Association. This contains four art designs, emblematic of the stars, moon, sun, and the "Tungstolier," respectively.

THE WALLACE-BARNES COMPANY, Bristol, Conn., has issued Catalogue No. 5, dealing especially with all kinds of springs. This catalogue differs from the preceding one in that it includes a description of many forms of hardened and tempered washers, of which the company has recently been making a specialty, and of screw-machine products.

THE WESTERN ELECTRIC COMPANY, of Chicago and New York, has prepared a timely souvenir post card on which is shown a manifestation of the comfort obtained by the use of its electric fans in this torrid season. It also invites recipients of this card to ask for its fan motor catalogue and to request a quotation on any type of fan desired.

THE WESCO SUPPLY COMPANY, St. Louis, Mo., is distributing a series of illustrated bulletins describing Wesco transformers, alternating-current generators, induction motors, bipolar generators and motors, multipolar belted generators and motors, switchboard instruments, direct-current and alternating-current switchboards, and direct-current motors. A copy of any of these bulletins, or of the entire set, can be obtained on request.

THE NATIONAL AIR FILTER COMPANY, Chicago, Ill., manufacturing the Shaffner ozonizer, which is making such a stir among medical and electrical authorities, has been fortunate in securing, this week, Arthur D. Lord for its general manager. Mr. Lord was formerly connected with the well-known advertising firm of Lord & Thomas, of Chicago, and brings with him a reputation for straightforward and businesslike capacity which augurs well for the prosperity of the new ozonizer concern.

ADOLPHUS BUSCH, South Side Bank Building, St. Louis, Mo., announces that he has purchased the patents, patent rights, good-will, and all unencumbered physical assets of the American Diesel Engine Company, and that it is his intention to organize and finance a company in St. Louis, in the near future. In the meantime the business will be conducted in the name of "Adolphus Busch, Purchaser of American Diesel Engine Company," and will be managed by experts at the location named above.

THE EMERSON ELECTRIC MANUFACTURING COMPANY, of St. Louis, Mo., has just published Bulletin No. 3216, devoted to bipolar ventilated motors for direct current. These machines are designed for an output of one-half horsepower and for speeds of 1,200 or 1,800 revolutions per minute. Compound motors of this type are carried in stock. Shunt wound and series motors, while not regularly carried in stock, are readily furnished to special order. These motors are wound for either 110 or 220 volts. They can also be provided with adjustable belt tighteners.

THE PACKARD ELECTRIC COMPANY, St. Catharines, Ont., has issued Bulletin 103 on large transformers for electric smelting. The 800-kilowatt transformer, for instance, is designed for primary voltages of 12,000, 11,700, 11,400, 11,100, and secondary voltages of fifty-five, sixty and sixty-five volts. Its height to the top of the leads is nearly seven feet. Among the plants for which the Packard company has supplied large installations of transformers for electric furnace service are those of Electro Metals, Limited, Welland, Ont., and the American Cyanamid Company, Niagara Falls, Ont.

THE CENTURY ELECTRIC COMPANY, of St. Louis, Mo., has published Bulletin No. 12, relating to single-phase, self-starting motors. In this bulletin there is given not only a detailed description of the motors but also a clear statement of their advantages, a complete listing of all sizes built, and nearly fifty excellent illustrations of these motors as equipped for a large number of special applications. The Century motors start as repulsion motors and when up to speed automatically become induction motors. They are arranged for operation on either 110 or 220 volt circuits, and are built for any specified frequency between twenty-five and 140 cycles.

THE AMERICAN CROSS-ARM COMPANY, of Chicago, Ill., has issued an interesting little folder on fir cross-arms. In it are clearly stated the advantages of fir for cross-arm material, among which are its great strength, freedom from knots, straightness in grain, the fact that it requires no preservative treatment, nor painting, and also its relatively light weight. In manufacturing its cross-arms the company has made use of expensive automatic machinery which insures that its material is cut to exact dimensions and turned out in as perfect condition as possible. Fir cross-arms are now used exclusively by the Bell telephone companies and the Postal Telegraph Company.

THE MACHEN & MAYER ELECTRIC MANUFACTURING COMPANY, of Philadelphia, Pa., announces that it has removed from its former location at Twelfth and Buttonwood streets to Seventeenth and Vine streets, where with greater quarters and more adequate facilities it will be better able to take care of its rapidly increasing business. The company began operations during October, 1907, and, notwithstanding the financial depression, its business has steadily grown until now it has been compelled to seek larger quarters. Among the products manufactured by the company are the well-known "M & M" specialties in the line of flush push-button switches, plugs and receptacles, pendent switches, wall cases, panel boards and cabinets. As before, M. B. Austin & Company will remain the distributers for the Chicago territory.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) June 22, 1909.

925,452. BATTERY HOLDER. Seth A. Brown, Buffalo, N. Y. Filed January 6, 1908. A plate of insulating material is adapted to be attached to a wall or support and has an upturned pin at its upper part and a shorter pin at its lower part, both pins having means for attaching electric wires thereto.

925,495. REGULATING STEP SWITCH. Benjamin McInnerney, Council Bluffs, Iowa. Filed June 28, 1907. A series of unequally disposed switches within the range of the field of a magnetic circuit are adapted to be successively operated by the variation of the intensity of magnetic field which is caused by a movable member actuated by the circuit.

925,499. DYNAMO-ELECTRIC MACHINERY. Charles A. Parsons and Alexander H. Law, Newcastle-upon-Tyne, England; said Law assignor to said Parsons. Filed October 8, 1906. Means for regulating the voltage as the load increases comprise field magnets, magnetic material bridging the poles of these field magnets, a winding on this magnetic material, and means supplying alternating current to the winding.

925,539. FUSE PLUG. August Weber, Jr., Schenectady, N. Y. Filed January 16, 1909. Has means provided for ventilation.

925,549. TROLLEY HOLDING AND RETRIEVING DEVICE. John W. Woodward, Rochester, N. Y. Filed June 13, 1908. A latch device is mounted on a supporting frame and held by gravity in engagement with a slidably mounted pin attached to a helical extension ring connected with the trolley pole for holding the same in erect position, and means connected with the device and pole are provided for releasing the device as the trolley pole ascends to a certain point for removing the tension of the spring to permit the pole to lower by gravity.

925,551. RHEOSTAT. William G. Abbott, Jr., Schenectady, N. Y., assignor to General Electric Company. Filed July 3, 1907. In combination with a hollow resistance rod are controlling means comprising a revoluble ring surrounding the rod, and a number of laminated brushes mounted therein and extending radially into engagement with the rod.

925,573. TELEPHONE-EXCHANGE SYSTEM. William A. Fricke, Chicago, Ill., assignor to Monarch Telephone Manufacturing Company. Filed April 11, 1908. Describes the details of an interior telephone system.

925,575. AUTOMATIC FIRE ALARM. Hermann Furlani, Pirano, Austria-Hungary. Filed December 30, 1908. Comprises a conductive tube with insulated electric terminals projecting into each end of it, and movable conductive material normally maintained out of contact with these terminals by separated fusible masses disposed at opposite ends of the tube and fusible at different temperatures, and an invertible back plate upon which the tube is mounted.

925,594. FAULT LOCATOR FOR ELECTRIC CABLES. Walter O. Pennell and Henry L. Hoffmann, Kansas City, Mo. Filed May 8, 1908. The method of locating a fault in an electric cable conductor consists in causing a varying current to flow through the conductor by way of the fault, causing the current to induce a current in the circuit of a detecting instrument, and rendering the circuit of the instrument neutral with respect to the varying current flowing in the sheath of the cable.

925,599. ELECTROPLATING APPARATUS. John B. Russ, Shelton, and Charles H. Poland, Bridgeport, Conn., assignors to the Robert N. Bassett Company, Shelton, Conn. Filed August 19, 1908. Has a drum mounted to rotate around the cathode member.

925,606. MEANS FOR AND METHOD OF DETERMINING POTENTIAL GRADIENTS. William Stanley, Great Barrington, Mass., assignor to General Electric Company. Filed May 13, 1905. Renewed May 5, 1909. The rotor has an induced winding and the stator has a symmetrically constructed winding dissymmetrically located relatively to the rotor windings and connected to the brushes.

925,607. SYSTEM FOR GENERATING ALTERNATING CURRENTS. William Stanley, Great Barrington, Mass., assignor to General Electric Company. Filed May 13, 1905. Renewed May 5, 1909. The potential gradient of a separately-engaged exciter is complimentary to the normal potential gradient of the alternator.

925,609. MICROPHONE. Harve R. Stuart, Wheeling, W. Va. Filed March 21, 1908. Has coils for receiving the voice currents and varying the flux entering the armatures in such a way as to cause the microphone electrodes to move simultaneously in opposite directions.

925,611. BLOCK-SIGNAL SYSTEM. Robert W. Taynton, Tacoma, Wash. Filed October 19, 1908. Describes the details of an electric block-signal system.

925,612. REFINING OF STEEL IN ELECTRIC FURNACES. Otto Thallner, Bismarckhütte, Germany, assignor to the Firm of Bismarckhütte, Germany. Filed June 17, 1908. Describes the process for refining steel, comprising the steps of refining the steel to high extent in a basic-lined electric furnace and then treating the same in an acid-lined electric furnace.

925,620. VAPOR-ELECTRIC APPARATUS. Chattin Bradway, Schenectady, N. Y., assignor to General Electric Company. Filed April 4, 1904. An exhausted chamber has electrodes therein, one at least of which is vaporizable, and an auxiliary starting circuit includes an arc-producing device which is located within the chamber and operates by expansion when heated with current.

925,622. ELECTRIC RAILWAY SIGNAL SYSTEM. Charles M. Cleavland, Wausau, Wis. Filed June 4, 1908. Comprises a conducting rail having its continuity broken, inclined guides or tracks approaching the brake in the conductor and flanking the conductor, a collecting shoe adapted to the rail and including an inclosing casing adapted to engage the guides or tracks, and means for carrying the collecting devices out of contact with the rail before the shoe is elevated above the same.

925,626. APPARATUS FOR RECOVERING METALS FROM ORES AND OTHER SUBSTANCES. Léon Dion, New York, N. Y., assignor to the Americus Electro-Hermatic Company, New York, N. Y. Filed March 4, 1904. In combination with a chamber adapted to receive the fumes, gases or vapors arising from the fusion of metal, or metals, are groups of electrodes between each of which groups these fumes, gases or vapors are caused to pass, arranged within such chamber with each of these groups constructed of material active upon a different and particular metal. Means are provided for supplying a current of electricity of a different strength to each of these groups, also a vessel into which the residue of the fumes, gases or vapors is finally delivered.

925,642. FIRING MECHANISM FOR GUNS. Abner Y. Leech, Jr., Washington, D. C., assignor to United States Ordnance Company. Filed December 24, 1907. The breechblock is revoluble eccentrically to the bore of the gun and has a combined electric and percussion firing mechanism.

925,653. MOTOR-CONTROLLING MECHANISM. Luther Roberson, Sharpsburg, Ky. Filed January 26, 1909. The movement of a truck carrying the motor-driven device to or from the motor operates a lever which applies or disengages a band brake for the motor.

925,666. ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINE. William Stanley, Great Barrington, Mass., assignor to General Electric Company. Filed May 13, 1905. Renewed May 5, 1909. The rotor windings and stator windings are connected together and connected in multiple arc to a common work circuit, the windings being each traversed by exciting and work currents, and means are provided for causing the work currents to vary automatically the magnetization of the machine so as to produce a rising potential upon an increase in the load of unity power-factor.

925,673. ELECTRICALLY-CONTROLLED VALVE-OPERATING MECHANISM. Henry W. Zook, Easton, Pa., assignor to Ingersoll-Rand Company. Filed December 17, 1907. The operating mechanism includes a toggle lever and an electromagnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve.

925,708. APPARATUS FOR VENTILATING AND COOLING STORAGE-BATTERY SYSTEMS. Simon Lake, Bridgeport, Conn. Filed October 31, 1908. A fan operates in a casing connected to one end of an air duct arranged in the storage-battery compartment.

925,732. ELECTRICAL SWITCHBOARD FOR THEATRES. Charles T. Waddell, Birmingham, Ala. Filed February 21, 1906. A lighting system for theatre stages comprises a border light having vari-colored electric lamps in separate circuits, two independent multi-point switches and circuit connections controlled thereby, each adapted to control the distribution of current to the several circuits, and two independently-operative dimming devices which control the voltage of the current distributed by the switches to the circuits.

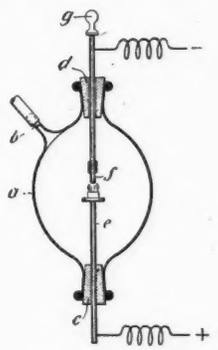
925,737. TELEGRAPH KEY. Laban Wilson, Sidney, W. Va. Filed March 11, 1908. Has a main lever, a secondary lever,

a crosspiece on the secondary lever, a yoke having members straddling the first lever, means for adjustably connecting the yoke with the crosspiece, and a stationary contact arranged in co-operative relation with the aforesaid members.

925,742. ELECTROMAGNETIC IGNITER. Charles S. Beardsley, Cleveland, Ohio. Filed August 7, 1908. In combination with an electromagnet and its armature are a vibrating contact arm and its stationary contact. The former is actuated by the armature, a permanent magnet normally opposes the electromagnet, and a separate armature therefor is normally retracted to maintain the contact in closed relation.

925,756. TELEPHONY. George C. Cummings, Western Springs, Ill. Filed July 20, 1908. Describes a system of telephony.

925,775. APPLIANCE FOR USE WITH TELEPHONE TRANSMITTERS. Edward F. Hutton, New York, and George A. Ellis, Jr., Bay Shore, N. Y., assignors to the Miniature Telephone Booth Company. Filed June 20, 1908. A telephone box or casing has means for detachably securing a portable telephone set therein, and a door secured thereto has a facial opening in it having substantially the contour of the lower portion of a person's face.



925,798.—APPARATUS FOR PRODUCING HOMOGENEOUS DUCTILE BODIES OF A HIGHLY REFRACTORY NATURE.

925,776. ELECTRIC-CURRENT REGULATOR. Herman A. Keip, Rochester, N. Y., assignor to Electro Surgical Instrument Company. Filed October 1, 1908. A cylindrical coil has one side flattened and is provided with two longitudinal series of contacts at the edges of the flattened portion, and a contact movable longitudinally of the coil is provided with two contact points to co-operate with the two longitudinal series of contacts on the coil.

925,790. INCANDESCENT LAMP. Charles C. Woodworth, Portland, Ore. Filed July 1, 1908. Has a resistance mounted in its base and an electromagnet in series with the lamp terminals and in shunt with the filament, an armature co-operating with the magnets and arranged to connect the resistance in series with the lamp terminals and in shunt with the magnet and filament, means for locking the armature in its attracted position, and magnetically operated means for releasing the armature.

925,798. APPARATUS FOR PRODUCING HOMOGENEOUS DUCTILE BODIES FROM METALS OF A HIGHLY-REFRACTORY NATURE. Werner von Bolton, Charlottenburg, Germany, assignor to Siemens & Halske, Aktiengesellschaft, Berlin, Germany. Filed September 29, 1905. A device for fusing highly refractory metal consists of an exhausted air chamber and a pair of electrodes of highly refractory conducing material located therein, one of these electrodes being provided with means for supporting a powder of the metal to be acted upon and the other with means for adjusting it relatively to the first electrode.

925,806. APPLIANCE FOR USE WITH TELEPHONE TRANSMITTERS. Orrin H. Goodrich, Castleton Corners, N. Y., assignor to the Miniature Telephone Booth Company. Filed September 14, 1908. An inclosing casing or box for a portable telephone transmitter is provided with a circuit-changing lever, and a circuit-changing arm exterior to the box and attached to a shaft journaled in one side of the box is adapted to support the receiver. Mechanical connections inside the box are adapted to actuate the circuit-changing lever.

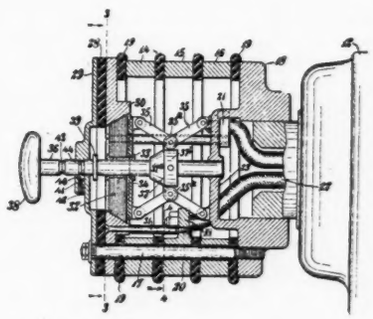
925,808. LIGHTING ATTACHMENT FOR GASEOUS-FUEL BURNERS. Charles E. Heft, Portland, Ore., assignor of one-half to Lettie B. Markham, Grand Rapids, Mich. Filed June 5, 1908. An electric contact is carried by a crankshaft and a second contact is pivotally supported in the path of movement of the first contact.

925,823. SHIELD FOR CIRCUIT-WIRE CONNECTIONS. Thomas E. Murray, New York, N. Y. Filed September 2, 1908. Comprises a block with lugs on it having openings and circuit conductors entering the openings in the block, a detachable tubular shield inclosing the conductors and surrounding the block openings, and a locking rod passing through the openings in the lugs and an arm on the shield.

925,830. MULTIPLE-CLUSTER-LAMP RECEPTACLE. Frank S. Ober, New York, N. Y. Filed February 26, 1909. Has an insulating base and two metallic plates supported respectively on the upper and lower faces of the base, the upper plate being formed with integral curved corrugated extremities constituting threaded shells and the other having center contacts.

925,838. CIRCUIT-BREAKING DEVICE. Edward L. Rancourt, Waterville, Me. Filed November 11, 1908. Describes the details of a spark timer for internal-combustion engines.

925,884. ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINE. Bernard Elshoff, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed November 30, 1906. Has means for short-circuiting the collector rings comprising contacts fixed rela-



925,884.—ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINE.

tive to the rings and conductively related thereto, and an axially movable contact is adapted to engage these relatively fixed contacts; also means for shifting the axially movable contact which comprise a toggle mechanism connected thereto and located within the rings, and a manually movable device in operative relation to the toggle mechanism.

925,887. AIR DRIER FOR STATIC ELECTRIC MACHINES. Mont R. Farrar, Greensboro, N. C. Filed June 29, 1908. Consists of a non-conducting outer shell having a removable door, a refrigerant receptacle contained therein, means for forcing a fluid medium through the shell, and a duct at each end of the shell communicating with a compartment whose air is to be dried.

925,902. ELECTRIC KILN. John L. Harper and William J. Larkworthy, Niagara Falls, N. Y.; said Larkworthy assignor to said Harper. Filed October 7, 1907. Renewed May 18, 1909. Consists of a tunnel divided into a longitudinal series of chambers, with means for electrically heating an intermediate chamber, and two trains or trucks movable in opposite directions through the tunnel, each chamber receiving two trucks and permitting the unrestricted flow of heat between the contents of the trucks.

925,925. TELEGRAPH TRANSMITTER. Charles W. Leiser, Salt Lake City, Utah. Filed January 29, 1909. A spring is provided for biasing an oscillatory armature arranged with its axis between the windings of an electromagnet. The armature is arranged to operate a circuit-closing device, and means are provided for preventing rebounding of the armature from a stop.

925,951. MAGNET. Hermann Ruthardt, Stuttgart, Germany. Filed April 3, 1908. A C-shaped disk or plate adapted to form an element of a field magnet has a circular armature gap in the field between its poles, the disk gradually increasing in width toward the gap on both sides of the same from a part intermediate to the ends.

925,956. DOOR OPENING AND CLOSING MECHANISM. Frank Scott, Orbisonia, Pa., assignor of one-half to James B. Shively, Shippensburg, Pa. Filed April 29, 1908. Is operated by an electric motor.

925,976. HIGH-SPEED DYNAMO-ELECTRIC MACHINE. Alfred H. Wouters, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed November 3, 1906. Has means whereby the removal of the

main field coil can be effected without disturbing the auxiliary field coils and without changing the position of the field yoke or any part of it.

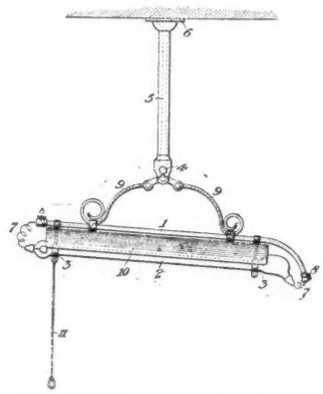
925,991. VENTILATING MEANS FOR LAMINATED CORES. Arthur J. Brown, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Filed October 19, 1905. A spacer for laminas of dynamo-electric machines comprises a member U-shaped in cross-section and having a laterally-extending holding wing or projection in the plane of the base of the U.

925,994. OIL-SWITCH. Herbert W. Cheney, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Filed August 30, 1905. Includes an oil tank having a cover, a pair of contacts therein, contact rods (on which the contacts are supported), extending out of the tank through the cover and supported thereon, means for connecting the contact rods to the main line leads, and means for rocking the rods to swing the contacts into and out of engagement.

925,995. CONTROLLER. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed January 8, 1908. A brush-carrying arm is movable relatively to the contacts about a pivot fixed in relation thereto, and a spring is movable about the same pivot into and out of engagement with the brush.

926,001. SWITCH. Gerald W. Hart, Hartford, Conn., assignor to the Hart Manufacturing Company. Filed October 15, 1908. Describes the details of a push-button switch.

926,020. TROLLEY ATTACHMENT. Frank V. Polakoskey, Peekskill, N. Y., assignor of one-third to P. W. O'Brien and one-third to Thomas McPhillips, Peekskill, N. Y. Filed June 23, 1908. In addition to the trolley wheel proper are grooved pulleys adapted to embrace the line wire.



926,057.—ADJUSTABLE SUPPORT FOR VAPOR LAMPS.

926,022. ELECTRIC BLOCK RAILWAY SIGNAL. Emory B. Samuels, Deatsville, Ky. Filed October 22, 1907. Describes the details of an electric block-signal system.

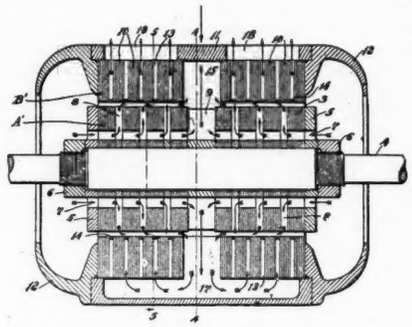
926,026. INDICATOR. Harry H. Shults, Cherry Creek, N. Y. Filed August 24, 1908. Electrically-controlled means limit the rotating movement of the shaft.

926,057. ADJUSTABLE SUPPORT FOR VAPOR LAMPS. Stanwood E. Flichtner, Englewood, N. J., assignor to Cooper Hewitt Electric Company. Original application filed July 28, 1904. Divided and this application filed January 9, 1905. The support comprises a depending hollow arm, a pair of hollow curved arms hinged to this, a hollow supporting rod with which these curved arms are connected, circuit wires leading to the electrodes of the lamp through the hollow parts or devices, and connectors secured to the ends of the hollow supporting rod.

926,066. MULTIPLE-CONTACT TIMER. Edwin S. Lincoln, Brookline, Mass., assignor to Electric Goods Manufacturing Company, Boston, Mass. Filed May 5, 1908. Describes the details of an electrical timer for the ignition system of multi-cylindered internal-combustion engines.

926,069. PROCESS OF TREATING METALLIC FILAMENTS FOR ELECTRIC INCANDESCENT LAMPS. Wilhelm Majert, Berlin, Germany. Filed July 10, 1908. Describes a process of cleaning metallic filaments for electric incandescent lamps and giving them a more compact structure, which consists in very highly heating the filaments twice in succession by the electric current, the first time when they are in a neutral atmosphere, and the second time when they are in a practically evacuated space.

926,082. SUPPLEMENTAL LIGHT FOR LAMPS. Edward E. Taylor and David H. Elkins, Amesbury, Mass., assignors to William Gray and Lambert Hollander, Amesbury, Mass. Filed January 16, 1909. A pivotally-supported electric lamp can be moved into position adjacent to an acetylene gas burner when the latter is not in use.



926,086.—DYNAMO-ELECTRIC MACHINE.

926,086. DYNAMO-ELECTRIC MACHINE. Bernard A. Behrend, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed August 21, 1905. The stator is provided with circumferential ventilating passageways all communicating with a chamber, and means are located at the middle of the rotor for forcing air into the chamber and thence through the circumferential passageways of the stator to cool the latter.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired June 28, 1909:

477,635. ELECTRICAL KEYBOARD. William E. Blodgett, Faribault, Minn.

477,645. BATTERY. William A. Childs, Englewood, N. J.

477,652. WRITING-TELEGRAPH SYSTEM. Harry Etheridge, Pittsburg, Pa.

477,665. INDIVIDUALIZING CUT-OUT PRINTING-TELEGRAPHS. Samuel R. Linville, Philadelphia, Pa.

477,708. ELECTRIC-CURRENT REGULATOR. Charles D. Sigsbee, United States Navy, and Thomas S. Hayward and Frank S. Anderson, Easton, Md.

477,729. DYNAMO-ELECTRIC MACHINE. James J. Wood, Fort Wayne, Ind.

477,735. PROCESS OF MAKING WHITE PIGMENTS. John Blair, Spokane, Wash.

477,835. PHONOPORIC TELEGRAPHY. Charles Langdon-Davies, London, England.

477,853. ELECTRIC TELEMETER. Cornelius T. Barrett, Brooklyn, N. Y.

477,866. TELEPHONY. Robert Hope-Jones, Birkenhead, England.

477,869. ELECTRIC SWITCH. Herbert M. Pilkington and Roger S. White, Brooklyn, N. Y.

477,870. ANTI-INDUCTIVE DEVICE FOR TELEPHONES. Simon Pollak, Prague, Austria-Hungary.

477,879. ELECTRIC-CURRENT TRANSFORMER. Norman T. Wilcox, Meriden, Conn.

477,897 and 477,898. ELECTRIC LOCK. William H. Hollar, Elizabeth, N. J.

477,914. SECONDARY BATTERY. William L. Silvey, Lima, Ohio.

477,931. TELEPHONE TABLET. Joseph S. Gold, Columbus, Ohio.

477,951. COMPOSITE ELECTRIC CONDUCTOR. Charles A. Mezger, Brooklyn, N. Y.

477,984. ELECTRIC LAMP OR CONDUCTOR SUPPORT. Charles Bell, Stroudsburg, Pa.

477,986. ELECTRICAL STOP-MOTION FOR KNITTING MACHINES. Albin Beyer, Brooklyn, N. Y.

478,018. ELECTRODE FOR SECONDARY BATTERIES. Harry G. Osburn, Chicago, Ill.

478,026. CONDUIT FOR ELECTRIC RAILWAYS. Carl T. H. Schwieger, Berlin, Germany.